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PREFACE

This report consists of brief reports of weed control studies conducted in 1961 in the North Central States of the United States and the four inland provinces of Canada. Many of the experiments reported are not completed, but it is hoped that these preliminary reports will be useful in providing leads for further research. This especially true of results with new herbicides, or with new uses for established ones.

This report is not intended to supplant full publication of completed research in established journals.

H. A. Friesen, Chairman
R. E. Nylund, Vice Chairman
Research Committee of The North
Central Weed Control Conference

CONTROL OF HERBACEOUS PERENNIAL WEEDS

Canada thistle control. Ascheman, R. E., Stroube, E. W., and Bondarenko, D. D. Amitrole, amitrole-T and methyldichlorobenzoic acid (HN-1688) were applied to a uniform, well-established stand of Canada thistle on September 9, 1960, at Columbus. The thistles were approximately 10 inches high and in a succulent growing condition when treated. Herbicides were applied in water at 40 gpa with a 3-gallon knapsack sprayer. The ratings were made on May 9, 1961, and were the average of three replications. Amitrole, applied at 4 lb/A, reduced Canada thistles 88%. Amitrole-T, applied at the rate of 4 lb/A of amitrole, reduced thistles 94%. HN-1688 at 3 and 6 lb/A reduced the thistles 40 and 62%. (The Ohio Agricultural Experiment Station)

Comparative effect of herbicides for couchgrass eradication. Carder, A.C. In mid-June, 1959, 11 herbicides were applied to a vigorous and continuous stand of couchgrass 1 ft. high. Plots were 1 sq. rod, triplicated. All herbicides were applied dry except TCA, erbon, and monuron, which were applied in water by knapsack sprayer using 160 gal/A. Soil was a rather heavy clay loam with adequate drainage. Weather at application time was dry, but light showers occurred during the following 2-3 weeks and heavy rains fell 2 months after treatment. Erbon, monuron, simazine, CBMM, and BMM eradicated the couchgrass at the heavier rates used. Although the maximum effect of erbon was obtained in the spring of the year following treatment, those of the other herbicides were not obtained until the second year following treatment. Of the herbicides non-lethal at the rates used, TCA, Concentrated Borascu, Atlacide, CBM and sodium chlorate produced their greatest effect in the spring following the year of treatment, while monuronTCA produced its maximum kill in the spring of the second year following treatment. Herbicide Report (Table on next page)

[1]Visual estimates by same appraiser. [2]Actual product/sq. rod.
[3]Borax 91% (Boron eq. 19.5%) [4]Sodium chlorate 59%.
[5]Monuron 1%, sodium chlorate 40%, sodium metaborate 57% (Boron eq. 4.5%).
[6]Monuron 4% disodium tetraborate pentahydrate 63%, disodium tetraborate decahydrate 31% (Boron eq. 13%).
[7]Disodium octaborate tetrahydrate 98% (Boron eq. 20.5%).
(Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Comparison of three herbicides for the control of couchgrass. Carder, A.C. In the spring of 1959 the herbicides were applied in water at the rate of 20 gal/A from a boom plot sprayer to an 8-in. high stand of vigorous couchgrass on a shallow black clay loam soil. Plots were 2 sq. rods and in triplicate. Three weeks after application the area was double one-way disced crosswise, followed in 6 weeks by a second double one-way discing. (Table on page 3). No treatment eradicated the couchgrass but high degrees of control were obtained, particularly by the 12 lb/A rate. The maximum effect of dalapon occurred one year after its application, while those of simazine and fenac were not obtained till the fall of the year following treatment; also the couchgrass was slower to recover after application of these herbicides than after dalapon. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Herbicide	Rate ai/ sq rod	Per cent stand[1] of couchgrass			
		1 yr after treatment		2 yr after treatment	
		Spring	Fall	Spring	Fall
TCA	8 oz	16	22	47	78
	10	21	31	50	82
	12	8	12	27	52
	14	7	16	32	60
Erbon	8 oz	3	5	11	17
	10	0.3	3	13	22
	12	0.7	0	2	6
	14	0	0	0.7	3
Monuron	2 oz	21	13	13	14
	4	12	1	0.3	1
	6	10	0	0	0
	8	10	0	0	0
Simazine	2 oz	12	4	6	8
	4	11	1	0	0
	6	5	0	0	0
	8	7	0.7	0.3	0
MonuronTCA (Urox)	2 oz	18	19	20	23
	3	22	26	19	30
	4	20	17	12	16
	5	20	22	14	22
Concentrated Borascu[3]	8 lb[2]	58	92	88	98
	12	27	67	68	83
	16	18	68	68	80
	20	14	37	31	38
Atlacide[4]	2 lb[2]	77	83	87	98
	4	37	42	60	83
	6	37	52	67	88
	8	14	23	32	72
CBMM (Chlorea[5])	2 lb[2]	26	25	21	33
	4	6	4	3	9
	6	3	3	2	3
	8	0.7	0.3	0	0
BMM (Ureabor[6])	3 lb[2]	12	3	2	5
	4	9	0.3	0.3	0.6
	5	7	0.3	0	0
	6	7	0	0	0
CBM (Polybor chlorate[7])	6 lb[2]	45	62	83	83
	8	32	52	67	78
	10	15	26	44	63
	12	15	22	35	58
Sodium chlorate	2 lb[2]	60	73	78	92
	4	24	30	53	77
	8	3	6	10	19

Herbicide	lb/A	Per cent stand* of couchgrass: Yr. after treatment, Spring	Yr. after treatment, Fall	2nd yr. after treatment, Spring	2nd yr. after treatment, Fall
Nil		40	75	90	100
Dalapon	8	12	31	66	84
	12	8	16	46	61
Simazine	8	12	10	22	29
	12	10	8	17	19
Fenac	8	10	7	18	37
	12	6	3	9	13

*Visual estimates by same appraiser.

Treatment of couchgrass with fenac combined with tillage. Carder, A.C. A vigorous and continuous stand of couchgrass in shot-blade on a heavy clay loam soil was treated in late June of 1960 with fenac. Surface and subsoil moisture reserves were excellent. Heavy rains fell before and after treatment. The herbicide was applied from a boom plot sprayer using 60 gal/a of water. Plots were 2 sq. rods in size and triplicated. Tillage treatments comprized double one-way discing on the halflap the day before and 5 days after fenac application.

Treatment	lb/A fenac	Per cent stand[1] of couchgrass at maximum kill[2]
One-way disced, fenac	0	77
	4	67
	8	54
	12	38
Fenac, one-way disced	0	83
	4	37
	8	26
	12	22
One-way disced, fenac applied, one-way disced	0	58
	4	27
	8	22
	12	18

[1]Visual estimates. [2]Obtained one year after treatment.

Fenac was more effective when tillage followed its application than when tillage preceded it. Even so, satisfactory control was not obtained at the rates used and was less than that from a previous test using the same rates of fenac but a more intense follow-up tillage method (note abstract immediately above). Off-test results showed that fenac has little lethal action on couchgrass unless combined with tillage. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Treatment of couchgrass with monuron alone and combined with tillage. Carder, A.C. Couchgrass on shallow black loam soil was treated in late spring and early fall of 1952 with monuron. Treatments were made after about 20 in. of leaf growth were mowed and raked off. The herbicide was knapsack-sprayed in water suspension at the rate of 80 gal/A on duplicate sq-rod plots. Four series of treatments were involved: 1) monuron on undisturbed sod, 2) monuron applied, one-way disced 2 weeks later, 3) one-way disced, monuron applied immediately, 4) one-way disced, monuron applied, one-way disced. Results from the fall treatments closely paralleled those from the spring applications, except that they were generally less effective. Best kills were obtained where monuron was used without tillage.

Years after treatment	Per cent stand* of couchgrass following application of monuron to undisturbed sod — Rate, lb/A monuron: 10	20	40	80
1	15	5	1	0
2	8	0	0	0
3	12	2	0	0
4	8	2	0	0
5	15	8	0	0
6	23	14	0	0
7	30	20	4	2
8	52	26	7	3
9	82	50	8	4

*Visual estimates by same appraiser.

The slow-acting and long-lasting residual effect of monuron is indicated. Although 10 lb/A of monuron was not sufficient to eradicate, its effect was still operative after 9 years. The rate of 20 lb/A eradicated, and where 40 and 80 lb/A were applied the couchgrass did not invade from untreated plot margins until the 7th year following treatment. In the spring of every 3rd year since the monuron applications were made, wheat, barley, oats, flax and peas have been sown on the 40- and 80-lb/A plots. No worthwhile stand of these crops has even been obtained even where the lighter rate was applied. Flax seems to have somewhat more tolerance to monuron than the other crops. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Treatment of couchgrass with TCA alone and combined with tillage. Carder, A.C. In late June of 1960, TCA was applied from a boom plot sprayer using 60 gal/A of water on a vigorous and continuous stand of couchgrass in shot-blade. The heavy clay loam soil contained excellent surface and deep moisture reserves. Heavy rains fell before and after treatment. Plots were 2 sq. rods, triplicated. Tillage consisted of double one-way discing on the halflap. (Table on next page) TCA alone gave as high a degree of kill as TCA applied with the most effective tillage method, i.e., tillage 2 weeks after chemical treatment. Tillage prior to TCA application markedly reduced the effectiveness of TCA, while tillage before and after chemical application was no more effective than tillage given only after. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Treatment	Lb/A TCA	Per cent stand[1] of couchgrass at maximum kill[2]
TCA on undisturbed sod	0	100
	50	9
	75	1
	100	0.3
TCE, one-way disced 2 weeks later	0	71
	50	7
	75	5
	100	1
One-way disced, TCA applied 1 week later	0	95
	50	52
	75	38
	100	27
One-way disced, TCA, one-way disced	0	72
	50	8
	75	9
	100	3

[1]Visual estimates. [2]Obtained one year after treatment.

Effect of grass competition on toadflax. Carder, A.C. In 1952 a vigorous and heavy infestation of toadflax on a friable black loam soil was plowed, worked down and fallowed, followed in the subsequent spring by seeding half to brome-grass and half to creeping red fescue. Good stands of grass were obtained along with a considerable growth of toadflax, consisting of seedlings and resprouts from root sections. In the summer of 1959 the area was plowed and worked down by disc harrow to renovate the grass meadows; a light disc harrowing was given also in the spring of 1960. Assessment of toadflax was made in the fall of each year and involved quadruplicate random plots 2 sq. rods in size.

Per cent stand[1] of toadflax following planting of grass

Years after planting	Bromegrass	Creeping red fescue
0[2]	80	80
1	40	50
2	10	22
3	3	14
4	3	13
5	1	6
6[3]	-	-
7	39	64
8	16	82

[1]Visual estimates by same appraiser. [2]Year of planting. [3]Year sod broken.

Both species of grass offered strong competition to the toadflax, particularly brome which in the 5th year from time of planting had almost eliminated the weed. Toadflax was stimulated by breaking of the grass sods. This resurgence was mostly from seed, but there was the occasional plant which arose from an old root section. In the second year following breaking the toadflax was much suppressed

by the rejuvenated bromegrass, but fescue did not hold its own with the weed. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Effect of MCPA and 2,4-D on stand of field horsetail. Carder, A.C. In the summer of 1960 the herbicides were knapsack sprayed in water at 30 gal/A to a dense stand of field horsetail, on a good grade of Grey Wooded soil. Plots were 1 sq. rod, triplicated. Top growth kill was assessed in 1960 about 2 weeks after herbicide application or at time of maximum effect; while plant counts were obtained in the summer of 1961, one year after treatment.

Date of application	Per cent horsetail plants emerged	Oz/A herbicide						
		Nil	2,4-D butyl ester		MCPA butyl ester			
			2	4	2	4	8	16
Per cent top growth kill[1], 1960								
June 28	75	0	5	30	30	83	87	98
July 12	100	0	53	79	89	97	99	100
No. of horsetail plants[2], 1961								
June 28	75	298	357	251	200	219	203	110
July 12	100	291	229	291	195	118	173	125

[1]Visual estimates. [2]Per three sq. yd. samples.

Rate for rate, MCPA was more effective than 2,4-D both from the standpoint of top-growth kill and stand reduction of field horsetail. In both instances, MCPA at 2 oz/A was more effective than 2,4-D at 4 oz/A. The July 12 application was more lethal than the earlies treatment, particularly concerning top-growth kill. The July MCPA application at 4, 8 and 16 oz/A reduced the stand by about half as did the 16 oz/A treatment of this herbicide when applied at the earlier date. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Effect of amitrole and CP 18-15 (chlorinated benzoic and cresoxyacetic acid mixture) on a stand of field horsetail. Carder, A.C. In the summer of 1960 the herbicides were knapsack sprayed in water at 30 gal/A to a dense stand of field horsetail, on a deep, friable silt loam. Plots were 1 sq. rod in size and in triplicate and were assessed in the summer of 1961 for field horsetail stand reduction.

Date applied	Per cent horsetail plants emerged	Height in.	Per cent reduction of stand* one year after treatment											
			Amitrole lb/A				Amitrole-T lb/A				CP 18-15 lb/A			
			½	1	2	4	½	1	2	4	½	1	2	4
July 7	70	8	4	5	10	23	2	5	17	22	0	0	3	8
July 22	100	15	2	28	38	72	22	29	62	68	5	8	7	3

*Visual estimates.

The amitroles were much more effective when applied after the vegetative field horsetail shoots had completely emerged. Amitrole-T seemed little, if any, more lethal than amitrole, with the 4 lb/A rate of either giving when applied at the later date about a 70% stand reduction. CP 18-15 was ineffectual at the rates used. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

TBA, PBA, amitrole-T, simazine, fenac, 2,4-D acid and 2-methoxy-3,6-dichlorobenzoic acid for eliminating Canada thistle. Derscheid, Lyle A., Wallace, Wilford H. and Wrage, Leon. The above herbicides were applied with a logarithmic sprayer at three locations during late spring, late summer or early fall 1960. Evaluations were made for several rates of application during the summer of 1961. The treatments, dates of treatment, evaluation dates and estimated percent of elimination are given below:

Herbicide	Date treated 1960	Date evaluated 1961	Percent elimination by various application rates, lb/A				
2,3,6-TBA (dimethyl amine)			28	21	14	7	3 1/2
	6/27	6/9	100	100	100	99	50
	7/1	6/16	100	100	95	50	10
	10/4	7/20	100	100	100	99	90
2,3,6-TBA (Li salt)			14	10 1/2	7	3 1/2	1 3/4
	6/27	6/9	99	75	70	50	0
	7/1	6/16	95	85	50	10	0
	10/4	7/21	100	100	100	95	75
PBA (dimethyl amine)			56	42	28	14	7
	7/1	6/16	99	95	95	50	10
	10/4	7/21	100	100	99	80	50
Fenac			21	15	10 1/2	5 1/4	2 1/2
	6/27	6/9	95	99	95	90	75
	7/1	6/16	95	95	95	50	10
	10/14	7/21	95	95	90	90	90
2-methoxy-3,6-dichlorobenzoic acid			28	21	14	7	3 1/2
	7/1	6/16	99	90	90	80	50
	10/4	7/21	100	100	99	85	75
Amitrole-T			28	21	14	7	3 1/2
	6/27	6/9	25	25	25	25	30
	7/1	6/16	80	50	50	60	40
	10/4	7/20	0	0	0	0	0
Simazine			30	22 1/2	15	7 1/2	3 3/4
	7/1	6/16	90	50	10	0	0
	10/4	7/21	0	0	0	0	0
2,4-D (acid formulation)			42	31 1/2	21	10 1/2	50 1/4
	7/1	6/16	95	60	60	50	50
	7/1	6/16	90	90	80	80	70

Minimum lethal dosages appeared to be 14-21 lb/A 2,3,6-TBA amine; 14 lb/A Li-TBA; 28-42 lb/A PBA; 15 lb/A fenac; and 21-28 lb/A 2-methoxy-3,6-dichlorobenzoic acid. Amitrole-T, simazine and 2,4-D acid were unsatisfactory at rates of 28, 30, and 42 lb/A, respectively. Date of application had little influence on the effectiveness of the herbicides. (Contributed by Agronomy Department, South Dakota State College, Brookings, S. Dak.)

<u>TBA, PBA, amitrole-T, simazine, fenac, amiben, 2,4-D acid and 2-methoxy-3-6-dichlorobenzoic acid for eliminating perennial sowthistle</u>. Derscheid, Lyle A., Wallace, Wilford H. and Wrage, Leon. The above herbicides were applied with a logarithmic sprayer at two locations during late spring, late summer or early fall 1960. Evaluations were made for several rates of application during the summer of 1961. The treatments, dates of treatment, evaluation dates and estimated percent of elimination are given below:

Herbicide	Date treated 1960	Date evaluated 1961	Percent elimination by various application rates, lb/A				
2,3,6-TBA (dimethylamine)			28	21	14	7	3 1/2
	7/1	6/16	100	100	100	100	100
	8/24	7/19	100	100	100	95	90
2,3,6-TBA (Li salt)			14	10 1/2	7	3 1/2	1 3/4
	7/1	6/16	100	100	100	100	100
	8/24	7/19	100	99	99	90	70
PBA (dimethylamine)			56	42	28	14	7
	7/1	6/16	100	100	95	100	90
	8/24	7/19	99	90	90	50	0
Fenac			21	15	10 1/2	5 1/4	2 1/2
	7/1	6/16	100	100	100	100	100
	8/24	7/19	99	99	99	99	90
2-methoxy-3,6-dichlorobenzoic acid			28	21	14	7	3 1/2
	7/1	6/16	100	100	100	100	100
	8/24	7/19	99	99	99	99	95
Amitrole-T			28	21	14	7	3 1/2
	7/1	6/16	0	95	100	100	100
	8/24	7/19	90	70	50	0	0
Simazine			30	22 1/2	15	7 1/2	3 3/4
	7/1	6/16	100	100	95	100	100
	8/24	7/19	99	99	99	75	0
2,4-D (acid formulation)			42	31 1/2	21	10 1/2	5 1/4
	8/24	7/19	50	25	10	0	0
Amiben			28	21	14	7	3 1/2
	7/1	6/16	50	25	0	0	0
	8/24	7/19	75	50	10	0	0

Minimum lethal dosages appear to be 7-14 lb/A 2,3,6-TBA amine; 7 lb/A Li-TBA; 42 lb/A PBA; 15 lb/A fenac; 3-7 lb/A 2-methoxy-3,6-dichlorobenzoic acid; and 20 lb/A simazine. Results with amitrole-T were erratic, but 2,4-D acid and amiben were not satisfactory. Date of application had little influence on the effectiveness of the herbicides. (Contributed by Agronomy Department, South Dakota State College, Brookings, S. Dak.)

<u>2,3,6-TBA, PBA, amitrole-T, simazine, fenac, amiben, 2,4-D acid and 2-methoxy-3-6-dichlorobenzoic acid for eliminating field bindweed</u>. Derscheid, Lyle A., Wallace, Wilford H. and Wrage, Leon. The above herbicides were applied with a logarithmic sprayer at six locations during late spring, late summer or early fall 1960. Evaluations were made for several rates of application during the summer of 1961. The treatments, dates of treatment, evaluation dates and estimates percent of elimination are given below:

Herbicide	Date treated 1960	Date evaluated 1961	Per cent elimination by various application rates, lb/A				
<u>2,3,6-TBA (dimethyl amine)</u>			28	21	14	7	3 1/2
	7/6	6/7	100	100	100	---	---
	6/28	6/9	100	100	100	100	100
	8/18	6/16	100	100	100	100	100
	8/23	7/20	100	99	99	99	99
	8/24	7/19	99	99	99	99	90
	10/4	7/20	100	100	99	90	80
<u>2,3,6-TBA (Li salt)</u>			14	10 1/2	7	3 1/2	1 3/4
	7/6	6/7	100	100	99		
	6/28	6/9	100	100	100	100	100
	8/18	6/16	100	100	99	85	85
	8/23	7/20	99	99	95	95	95
	8/24	7/19	99	99	99	99	20
	10/4	7/21	100	100	99	25	0
<u>PBA (dimethyl amine)</u>			56	42	28	14	7
	7/6	6/7	100	100	100	---	---
	6/28	6/9	100	100	100	100	---
	8/18	6/16	100	100	90	80	---
	8/23	7/20	100	100	100	95	75
	8/24	7/19	100	100	99	99	0
	10/4	7/21	100	99	95	50	50
<u>Fenac</u>			21	15	10 1/2	5 1/4	2 1/2
	7/6	6/7	100	100	100	---	---
	6/28	6/9	100	100	100	100	100
	8/18	6/16	50	50	50	50	50
	8/23	7/20	99	99	95	90	90
	8/24	7/19	100	100	100	100	95
	10/4	7/21	99	90	75	0	0
<u>2-methoxy-3,6-dichlorobenzoic acid</u>			28	21	14	7	3 1/2
	7/6	6/7	100	100	100	---	---
	6/28	6/9	100	100	100	95	90
	8/23	7/20	100	100	100	100	100
	8/24	7/19	100	100	100	90	0
	10/4	7/21	99	99	90	70	50

Amitrole-T			28	21	14	7	3 1/2
	7/6	6/7	0	0	0	0	0
	6/28	6/9	100	99	99	0	0
	8/18	6/16	100	100	100	100	100
	8/23	7/20	50	50	25	0	0
	8/24	7/19	0	0	0	0	0
	10/4	7/20	0	0	0	0	0
Simazine			30	22 1/2	15	7 1/2	3 3/4
	7/6	6/7	0	0	0	0	0
	6/28	6/9	0	0	0	0	0
	8/18	6/16	0	0	0	0	0
	8/23	7/20	0	0	0	0	0
	8/24	7/19	99	99	99	0	0
	10/4	7/21	0	0	0	0	0
2,4-D (acid formulation)			42	31 1/2	21	10 1/2	5 1/4
	6/28	6/9	0	0	0	0	0
	8/18	6/16	100	100	100	90	90
	8/23	7/20	100	100	100	100	99
	8/24	7/19	100	100	95	30	0
	9/4	7/21	25	0	0	0	0
Amiben			28	21	14	7	3 1/2
	6/28	6/9	50	40	0	0	0
	8/18	6/16	95	95	95	75	50
	8/23	7/20	90	75	0	0	0
	8/24	7/19	99	90	40	0	0
	10/4	7/20	95	25	0	0	0

Minimum lethal dosages appeared to be 7-14 lb/A of 2,3,6-TBA amine; 7-10 lb/A of Li-TBA; 28-42 lb/A of PBA; 10-15 lb/A of fenac; and 7-14 lb/A of 2-methoxy-3,6-dichlorobenzoic acid. Amitrole-T, simazine, and amiben were unsatisfactory at 28, 30, and 28 lb/A respectively. 2,4-D at 20 to 30 lb/A was effective when applied in August. Date of application appeared to have little influence on the results of other chemicals. (Contributed by the Agronomy Department, South Dakota State College, Brookings, S. Dak.).

TBA, PBA, amitrole-T, simazine, fenac, amiben, 2,4-D acid, and 2-methoxy-3,6-dichlorobenzoic acid for eliminating Russian knapweed. Derscheid, Lyle A., Wallace, Wilford H. and Wrage, Leon. The above herbicides were applied with a logarithmic sprayer at five locations during late spring, late summer or early fall 1960. Evaluations were made for several rates of application during the summer of 1961. The treatments, dates of treatment, evaluation dates and estimated percent of elimination are given on next page. (Table on next page) Minimum lethal dosages appeared to be 21 lb/A 2,3,6-TBA amine; 14+ lb/A Li-TBA; 42-56 lb/A PBA; 15 lb/A fenac; 14 lb/A 2-methoxy-3,6-dichlorobenzoic acid; and 31-42 lb/A 2,4-D acid. Amitrole-T, simazine and amiben were unsatisfactory at 28, 30 and 28 lb/A respectively. Date of application appeared to have little influence on the effectiveness of the herbicides. (Contributed by Agronomy Department, South Dakota State College, Brookings, S. Dak.).

Herbicide	Date treated 1960	Date evaluated 1961	Per cent elimination by various application rates, lb/A				
2,3,6-TBA (dimethyl amine)			28	21	14	7	3 1/2
	7/6	6/7	98	98	98	65	0
	6/27	6/9	99	99	99	95	75
	8/15	6/9	99	99	99	90	50
	8/15	6/8	99	99	95	0	0
	10/1	6/9	100	100	99	99	75
2,3,6-TBA (Li salt)			14	10 1/2	7	3 1/2	1 3/4
	7/6	6/7	90	90	90	50	0
	6/27	6/9	99	99	95	80	35
	8/15	6/9	99	99	99	50	0
	8/15	6/8	99	90	0	0	---
	10/1	6/9	100	100	99	95	75
PBA (dimethyl amine)			56	42	28	14	7
	7/6	6/7	95	95	90	40	25
	6/27	6/9	100	99	99	75	75
	8/15	6/7	99	99	85	50	0
	8/15	6/8	99	95	95	0	0
	10/1	6/9	100	100	95	75	60
Fenac			21	15	10 1/2	5 1/4	2 1/2
	7/6	6/7	100	100	100	98	75
	6/27	6/9	100	100	99	95	90
	8/15	6/9	100	100	100	95	50
	8/15	6/8	100	99	95	95	---
	10/1	6/9	100	100	99	95	75
2-methoxy-3,6-dichlorobenzoic acid			28	21	14	7	3 1/2
	7/6	6/7	100	100	100	98	90
	6/27	6/9	100	100	100	100	100
	8/15	6/8	100	99	99	20	0
	10/1	6/9	100	100	100	100	100
Amitrole-T			28	21	14	7	3 1/2
	7/6	6/9	25	25	25	25	0
	6/27	6/9	85	70	85	90	90
	8/5	6/9	0	0	0	0	0
	8/15	6/8	0	0	0	0	0
	10/1	6/9	0	0	0	0	0
Simazine			30	22 1/2	15	7 1/2	3 3/4
	7/6	6/7	25	25	25	25	0
	6/27	6/9	0	0	0	0	0
	8/15	6/9	0	0	0	0	0
	8/15	6/8	90	90	95	0	0
	10/1	6/9	0	0	0	0	0

2,4-D (acid formulation)			42	31 1/2	21	10 1/2	5 1/4
	6/28	6/8	---	---	85	80	50
	6/27	6/9	100	99	90	80	75
	8/15	6/8	100	99	99	20	---
	9/1	6/9	0	0	0	0	0
Amiben			28	21	14	7	3 1/2
	8/15	6/8	90	80	40	0	---
	10/1	6/9	75	25	0	0	0

<u>TBA, PBA, amitrole-T, simazine, fenac, amiben, 2,4-D acid and 2-methoxy-3,6-dichlorobenzoic acid for eliminating leafy spurge</u>. Derscheid, Lyle A., Wallace, Wilford H. and Wrage, Leon. The above herbicides were applied with a logarithmic sprayer at three locations during late spring, late summer or early fall 1960. Evaluations were made for several rates of application during the summer of 1961. The treatments, dates of treatment, evaluation dates and estimated percent of elimination are given on next page. (Table on next page). Minimum lethal dosages appeared to be 14-20 lb/A 2,3,6-TBA amine; 10 lb/A Li-TBA; 28-42 lb/A PBA; 10-15 lb/A fenac; 14-21 lb/A 2-methoxy-3,6-dichlorobenzoic acid. Amitrole-T, simazine, 2,4-D acid and amiben were unsatisfactory at 28, 30, 42, and 28 lb/A, respectively. Date of application appeared to have little influence on the effectiveness of the herbicides. (Contributed by Agronomy Department, South Dakota State College, Brookings, S. Dak.)

<u>The influence of rate and treatment interval of dalapon, sodium salt, on Johnsongrass control</u>. Hicks, Raymond D. and Fletchall, O. Hale. Yearly rates of 5, 10, 15, 20, 30, 40, 60, and 80 pounds of 74% dalapon, sodium salt, were applied in water solution on Johnsongrass. These rates were applied as a single treatment and as a split treatments of 2, 3, or 4 applications. The split applications were applied at intervals of one to eight weeks. Results were measured by differences in plant counts made in the spring before spraying and again in the spring of the next year after treatment. Results indicate better control with a given annual rate applied in four applications than with the same amount applied in one, two or three applications. Better kill was obtained when the interval between applications was extended as the application rate was increased. Results showed that an individual application rate of $2\frac{1}{2}$ lb/A may require retreatment at about one week intervals for continuous suppression and final kill. As the individual application rate is increased, treatment interval may be lengthened by one week for each additional $1\frac{1}{4}$ lb/A applied. This held true until the interval between treatments reached about 6 weeks, when moisture was adequate for normal growth, retreatments were needed at about 6-week intervals regardless of the individual application rate used. There was a tendency for satisfactory results to be obtained with retreatment intervals somewhat greater than those mentioned above in the latter part of the growing season. This has been observed to be especially true during periods of dry soil conditions. (Contribution of the Department of Field Crops, University of Missouri, Columbia, Missouri.)

Herbicides	Date treated 1960	Date evaluated 1961	Percent elimination by various application rates, lb/A				
2,3,6-TBA (dimethyl amine)			28	21	14	7	3 1/2
	6/28	6/8	100	100	100	99	60
	8/24	7/19	99	99	90	0	0
	9/2	7/19	100	100	100	0	0
2,3,6-TBA (Li salt)			14	10 1/2	7	3 1/2	1 3/4
	6/28	6/8	100	98	100	60	0
	8/24	7/19	95	80	80	0	0
	9/2	7/19	100	100	85	50	0
PBA (dimethyl amine)			56	42	28	14	7
	7/1	6/16	100	100	100	90	40
	8/24	7/19	99	99	90	25	0
	9/2	7/19	100	100	99	20	0
Fenac			21	15	10 1/2	5 1/4	2 1/2
	6/28	6/8	100	100	100	100	80
	8/24	7/19	99	99	95	90	80
	9/2	7/19	100	100	99	50	0
2-methoxy-3,6-dichlorobenzoic acid			28	21	14	7	3 1/2
	7/1	6/16	100	100	100	100	100
	8/24	7/19	99	99	95	90	90
	9/2	7/19	100	99	75	50	0
Amitrole-T			28	21	14	7	3 1/2
	7/1	6/16	75	0	0	0	0
	8/24	7/19	0	0	0	0	0
	9/2	7/19	99	50	50	0	0
Simazine			30	22 1/2	15	7 1/2	3 3/4
	8/24	7/19	0	0	0	0	0
	9/2	7/19	0	0	0	0	0
2,4-D (acid formulation)			42	31 1/2	21	10 1/2	5 1/4
	7/1	6/16	50	25	50	50	0
	8/24	7/19	75	75	0	0	0
	9/2	7/19	80	60	30	0	0
Amiben			28	21	14	7	3 1/2
	7/1	6/16	95	95	90	--	--
	8/24	7/19	90	90	0	0	0
	9/2	7/19	0	0	0	0	0

The effect of adding surfactants to dalapon, sodium salt, for Johnsongrass control on non-crop land. Hicks, Raymond D. and Fletchall, O. Hale. The following surfactants were added to a water solution of dalapon, sodium salt, and applied to Johnsongrass, replicated 3 times, on the roadside at 7.4 lb/A of dalapon in 32 gpa of spray mixture:

Surfactant	Rate
Alkylarylpolyoxyethylene glycol (X-77)	.25% by volume
Polyoxyethylene thioether (Sterox SK)	.125% by volume
Polyoxyethylene ether (Sterox AJ-100)	.125% by volume

Treatments were applied September 6, 1960, on a thick, uniform stand of established Johnsongrass that had been previously mowed and allowed to regrow to a height of 12 to 18 inches. Plots were 20 x 100 ft. Control determinations were based on stem counts within six 20 x 40 inch quadrants. Counts were made prior to treatment and again in May, 1961. Results indicate no additional control from the surfactants over plots receiving 7.4 lb/A dalapon alone. (Contribution of the Field Crops Department, University of Missouri, Columbia, Missouri.)

The influence of volume of spray on dalapon, sodium salt, for Johnsongrass control. Hicks, Raymond D. and Fletchall, O. Hale. To determine the volume of spray that would give maximum control of Johnsongrass in non-cultivated areas, a constant rate (7.4 lb/A ae) of dalapon, sodium salt, was applied in water at 16, 32, 42, 55, 68, 77 and 94 gpa on July 6, 1960. The different volumes were obtained by varying the speed, pressure, and nozzle orifice used. The study was conducted on a highway right-of-way containing a thick, uniform infestation of established Johnsongrass. Plots were 20 by 100 ft. and replicated 4 times. Control was measured by the number of established Johnsongrass plants in the treated and untreated plots. Counts made in May, 1961, and observations continued to date, indicated no differences in kill when volumes of 16 to 94 gpa were used. (Contribution of the Field Crops Department, University of Missouri, Columbia, Missouri.)

Comparison of various sprays on Canada thistle. Vanden Born, Wm. H. Non-replicated 5' x 50' strips on non-cropped land infested with Canada thistle were sprayed on June 28, when the thistles were in the late bud stage, with 2,4-D (ethyl ester) at 8, 16, 24 oz/A; Embutox (4-(2,4-DB), butyl ester) at 8, 16, 24, 32 oz/A; Tropotox (4-(MCPB), sodium salt) at 8, 16, 24, 32 oz/A; Banvel D (2-methoxy-3,6-dichlorobenzoic acid) at 8, 16, 24 oz/A; Banvel T (2-methoxy-3,5,6-trichlorobenzoic acid) at 8, 16, 24 oz/A; amitrole at 2, 4, 8 lb/A; and amitrole-T at 2, 4, 8 lb/A; all in 20 gpa. Top growth of Canada thistle was killed by all rates of amitrole and amitrole-T, by 2,4-D at 24 oz/A, Embutox at 24 and 32 oz/A, and by Banvel D at 16, 24, and 32 oz/A. A variable amount of regrowth had appeared on all these plots by the middle of September. Root injury was observed only on the plots sprayed with 32 oz/A of Embutox and Tropotox, and even there the injury was slight and occurred only on some of the plants. Injury was observed only on the vertical underground parts less than 3" - 4" below the surface; lateral roots were healthy in appearance. Plant counts were made on all plots, and will be compared with counts on the same area in the spring for final conclusions. (Division of Crop Ecology, Department of Plant Science, University of Alberta.)

Soil fumigants for field bindweed control. A. F. Wiese and H. E. Rea. On September 26, 1959, SMDC (Vapam) at 3 pounds, DMTT (Mylone) at 2, 4, and 6 pounds, and ethylene dibromide at 9 and 18 pounds per square rod were applied to field bindweed in a wheat field and flood irrigated the following day. The soil type was Pullman clay loam. In May 1960, old bindweed were absent on plots treated with all rates of Mylone and ethylene dibromide. Seedlings were emerging on the ethylene dibromide plots. (Contribution of the Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA cooperating.) Approved as TAES T.A. 3941.

Trichlorobenzyloxypropanol and trichlorobenzyloxyethanol for field bindweed control. A. F. Wiese and H. E. Rea. During 1959, applications of trichlorobenzyloxypropanol and trichlorobenzyloxyethanol were made to ½ sq. rod plots of field bindweed during July (triplicated) and September (duplicated). The soil type was Pullman clay loam. Rainfall for 12 months following the July and September applications was 30 and 36 inches, respectively, which was considerably over the normal of 21 inches. Data were taken in September 1960. In July, all herbicides were applied at 2.5, 5.0, 7.5 and 10 lb/A. The average percent control obtained with the four rates was as follows: trichlorobenzyloxyethanol, 45; trichlorobenzyloxypropanol, 40; sodium salt of fenac, 40; ester formulation of fenac, 40; dimethylamine salt of 2,3,6-TBA, 35; granular formulation of fenac, 31; dimethylamine salt of PBA (30% trichlorobenzoic acid), 21 and amine salt of 2-methoxy-3,6-dichlorobenzoic acid, 13. LSD 0.05 for the average percent control was 14. In September, eradication had occurred with the following herbicides; trichlorobenzyloxypropanol at 15 lb/A, trichlorobenzyloxyethanol at 20 lb/A, sodium salt of fenac at 15 lb/A, ester formulation of fenac at 20 lb/A, acid formulation of fenac at 15 lb/A, 4 percent fenac plus sodium borates at 480 lb/A, prometone at 20 lb/A, atrazine at 40 lb/A and fenuron at 40 lb/A. In the same test a dimethylamine salt of PBA at 40 lb/A, monuron at 60 lb/A, dimethylamine salt of 2,3,6-TBA at 20 lb/A, anhydrous borax at 2560 lb/A and sodium chlorate at 800 lb/A gave 93, 92, 83, 73 and 65 percent control, respectively. (Contribution of Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA cooperating.) Approved as TAES T.A. 3937.

CONTROL OF HERBACEOUS ANNUAL WEEDS

Preplanting herbicides for wild oat control in wheat. Carder, A.C. On April 21, 1961, an area of fertile, black clay loam fallowed the year before and containing a heavy contamination of wild oat seeds was smoothed by drag harrow. On April 26, Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) and CP 23426 (2,3,3-trichloroallyl diisopropylthiolcarbamate) were applied by boom plot sprayer using 10 gal/A of water. Plots were 2 sq. rods, triplicated. Incorporation of the herbicides at 2 in. (shallow) and 4 in. (deep) by double disc harrow immediately followed. Soil was in good tilth for mixing. The following day, Saunders wheat was sown 3 in. deep. Forty lb/A of 11-48-0 fertilizer was drilled in with the grain. Seed-bed was dry due largely to surface moisture loss by incorporation procedures. However, 4 in. of snow a few days after planting induced satisfactory germination of the wheat. Most wild oats germinated at this time but the infestation was not heavy as indicated by the non-treated control plots. In early summer, the Avadex and CP 23426 treatments showed thinning of the wheat stands: slight at 1 lb/A, but quite noticeable at 1½-lb/A. Later, stooling of the wheat plants compensated this effect somewhat. The ununiform pattern of the wild oat infestation made interpretation of results difficult. However, observation and measurement indicated little difference between Avadex and CP 23426 either from standpoint of degree of wild oat control or injury to the wheat. Moreover, insofar as wild oat control is concerned, there was not much difference whether the herbicides were incorporated shallowly or deeply, but when deeply incorporated there was more injury to the wheat. The light rate of the herbicides gave about 70% wild oat control; the heavy rate about 75%. Yield reduction of wheat by the heavier rate was twice that by the lighter rate. There was some delay in maturity by the different treatments. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Herbicide	Tillage	Rate lb/A	Yield bu/A		Per cent reduction by herbicide		No. of days, planting to hard dough, wheat
			Wild oats*	Wheat	Wild oats	Wheat	
Avadex	Shallow	0	3.5	44.2			109
	incor-	1	1.5	42.1	58	5	112
	poration	1½	0.4	39.1	89	12	114
	Deep	0	3.2	40.5			110
	incorp-	1	0.9	37.3	72	8	112
	oration	1½	1.3	32.7	58	19	112
CP 23426	Shallow	0	4.8	44.2			111
	incorp-	1	0.8	41.5	82	6	112
	oration	1½	0.8	39.9	83	9	112
	Deep	0	2.6	44.0			110
	incorp-	1	0.7	37.5	74	15	113
	oration	1½	0.7	34.7	75	21	112

*Cleaned from grain plus shattered.

Barban (Carbyne) as a postemergence herbicide for wild oat control in barley. Carder, A.C. On April 27, 1961, Olli barley was planted at 2 bu/A on land fallowed the previous year and which had a heavy natural infestation of wild

oats. Forty lb/A of 11-48-0 fertilizer was drilled in with the grain. The soil was a black clay loam in good tilth, but with limited moisture reserves; however, 4 in. of snow a few days later induced good germination and a vigorous seedling growth. Plots were 9 x 30 ft., triplicated. On May 26, barban was applied by boom plot sprayer using 5 gal/A of water to the wild oats when in the $1\frac{1}{2}$ leaf stage. The barley at this time was in the 2-3 leaf stage, well established and growing rapidly to the detriment of the wild oats. The latter had sprouted fairly uniformly and since no further substantial rains fell until mid-June there were no later germinations of wild oats of consequence. Observations made throughout the season showed no effect of the barban on the barley except to delay maturity slightly.

Barban oz/A	Yield bu/A		Per cent reduction wild oats by barban	Per cent effect on barley by barban	No. of days, planting to hard dough, barley
	Wild oats*	Barley			
0	2.8	52.5			95
4	0.5	54.2	83	+3	96
6	0.4	51.9	85	-1	97
8	0.4	51.8	85	-1	100

*Cleaned from grain plus shattered.

Increasing the dosage of barban did not substantially increase the control of wild oats. The yield of barley was practically unchanged by treatment, but maturity was delayed 5 days by the heaviest rate. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Response of seedling grasses to barban (Carbyne). Carder, A.C. On April 27, 1961, plots of bromegrass and creeping red fescue were sown by Century grass seeder on land heavily contaminated with wild oats and which had been well-worked and fallowed the previous year. The seed-bed was rather dry at planting, but 4 in. of snow a few days after promoted satisfactory germination and encouraged the sprouting of wild oat seeds. Temperatures remained unusually cool until mid-May, resulting in slow seedling growth. On May 26, barban was applied in water at 5 gal/A at 0, 4, 6, and 8 oz/A when the majority of the wild oats were in the $1\frac{1}{2}$ leaf stage. At this time the grasses were emerging or in the spear leaf stage. No cereal companion crop was used. Plots were in triplicate and 9 x 30 ft. to accomodate a boom plot sprayer. Although assessment of injury by the herbicide to the grass seedlings was made difficult by new seedlings appearing after treatment, observation indicated no injury to those plants exposed to the herbicide. A heavy growth of wild oats established itself on the non-sprayed plots, while the treated plots which at first bore stunted wild oat plants later supported a scatter of well-stooled plants. However, the grass seedlings were well established by the time the effects of the barban on the wild oats had dissipated. There were no marked differences in wild oat or grass stand induced by the different rates of barban. The wild oats were mowed and removed prior to shattering of their seed. By fall, good stands of grass on the treated plots existed, while thin and weak stands were obtained on the control plots, presumably because of the competitive effect of the heavy growth of wild oats on these plots. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Selective control of scentless mayweed by herbicides. Carder, A.C. On June 5, 1961, a vigorous and heavy infestation (at least 4 plants sq. ft.) of scentless mayweed, in a stand of bromegrass growing on a heavy clay loam soil was treated with Fison's CP 18-15 (chlorinated benzoic and cresoxyacetic acid mixture) and 2-(MCPP). There were two generations of mayweed: 90% of them had germinated in the spring and averaged about 1 in. tall, while the remainder had over-wintered and were 3 in. tall. The bromegrass was 8 in. high and in early shot-blade and comprised an established stand thinned by a rejuvenation tillage procedure the year before. The herbicides were applied from a boomed plot sprayer using 10 gal/A of water. Plots were 2 sq. rods in size and in triplicate. Soil was moist and weather was warm at treatment time and these conditions remained for two months after.

Herbicide	lb/A	Per cent stand* of mayweed
Nil		100
CP 18-15	2	23
	3	18
	4	17
2-(MCPP)	1 1/2	9
	2	6

*Visual estimates.

Since the action of CP 18-15 is very slow, while that of 2-(MCPP) is much more rapid, it was difficult to truly compare the effect of these herbicides. The figures, based on maximum effect, indicate that 2-(MCPP) gave the best control. Both herbicides appeared not to affect the bromegrass. Seed yields of about 80 lb/A indicated no substantial differences between treated and untreated plots. (Canada Agriculture, Experimental Farm, Beaverlodge, Alberta).

Combinations of barban with 2,4-D, MCPA or dalapon on flax underseeded with alfalfa. Derscheid, Lyle A., Wallace, Wilford H., and Wrage, Leon. Quadruplicate 10-ft. x 30-ft. plots of Marine flax underseeded with Ranger alfalfa, naturally infested with wild oats (2.5 plants/sq. ft.), green and yellow foxtail, wild mustard and lambsquarters were sprayed with the above herbicides alone and in all combinations that included barban. The crops were seeded April 29. On May 22 barban 1/3 lb/A was applied when flax had 2 true leaves and wild oats was in 1 1/4 - leaf stage. Dalapon 1 lb/A, MCPA amine 1/4 lb/A, and 2,4-D amine 1/4 lb/A, were applied to some of the barban treated plots on the same day. The same herbicides were applied to untreated plots and other barban treated plots June 8 when the flax was 3 inches tall. All treatments were applied in 12 gal/A of spray. 2,4-D and MCPA were mixed with dalapon but none of the herbicides were mixed in the same tank with barban. Wild oats counts on 20-ft. x 6-inch belt transects were made July 11, flax yield samples from 2-ft. x 25-ft. areas were harvested Aug. 3, and alfalfa stands and foxtail control were estimated Aug. 15. The treatments and data are given on the next page. (Table on next page.) Flax yields were generally lower on plots treated with a split application and alfalfa stands were generally better. Barban appeared to have reduced wild oats stands 75% or more in all treatments except those containing MCPA. Barban was ineffective on foxtails, but dalapon generally killed over 90% of this weed regardless of date of application. (Contributed by the Agronomy Department, South Dakota State College, Brookings, S. Dak.)

Treatments: Herbicides	Lb/A	Flax yield % of ck	Alfalfa stand % of ck	Per cent Control Wild oats	Per cent Control Foxtail
Untreated	----	100	100	0	0
Barban*	1/3	84	97	77	8
Barban-2,4-D*	1/3-1/4	94	26	89	9
Barban-MCPA*	1/3-1/4	97	32	60	3
Barban-2,4-D-dalapon*	1/3-1/4-1	94	36	76	95
Barban-MCPA-dalapon*	1/3-1/4-1	76	26	46	91
Barban-dalapon*	1/3-1	91	95	24	94
Barban-2,4-D**	1/3-1/4	73	84	77	3
Barban-MCPA**	1/3-1/4	90	80	62	13
Barban-2,4-D dalapon**	1/3-1/4-1	70	97	82	85
Barban-MCPA-dalapon**	1/3-1/4-1	76	80	71	95
Barban-dalapon**	1/3-1	87	94	81	94
2,4-D amine**	1/4	88	92	9	21
MCPA amine**	1/4	102	81	-29	19
Dalapon**	1	80	96	17	95
2,4-D-dalapon**	1/4-1	82	91	0	96
MCPA-dalapon**	1/4-1	79	74	6	97

* 2,4-D, MCPA and dalapon applied same day as barban - wild oats 1 1/4-leaf stage.

** 2,4-D, MCPA and dalapon applied later - flax 3 inches tall.

<u>Amiben and combinations of 2,3-dichloroallyl diisopropylthiocarbamate (Avadex) with 2,4-D, MCPA and dalapon applied in flex underseeded with alfalfa</u>. Derscheid, Lyle A., Wallace, Wilford H., and Wrage, Leon. Triplicate 10 x 30 ft. plots of Marine flax underseeded with Ranger alfalfa and naturally infested with wild oats (3 plants/sq. ft.), green and yellow foxtail, wild mustard and lambsquarters were sprayed with the above named herbicides alone and in all combinations that included Avadex. Avadex at $1\frac{1}{4}$ lb/A, was applied and incorporated with a spike-tooth harrow April 28 and the crops were seeded April 29; amiben at 3 lb/A, was applied alone and incorporated at the same time. Dalapon 1 lb/A, 2,4-D amine 1/4 lb/A, and MCPA amine 1/4 lb/A, were applied June 8 when flax was 2 to 3 inches tall and weeds had emerged. All treatments were applied in 12 gal/A of spray. Wild oats stand counts on a 20-ft. x 6-in. belt transects were made July 11, flax yield samples were taken Aug. 3, and alfalfa stand counts and estimates of foxtail control were made Aug. 15. The data and treatments are given on next page. (Table on next page.) Flax yield was significantly higher on most treated plots except when dalapon was included in the treatment. Alfalfa stands were not seriously reduced by Avadex or dalapon alone or in combination, but MCPA appeared to have reduced the stand. Wild oats stands were reduced 70 to 80% on plots treated with Avadex. Foxtail stands were reduced 95 to 99% whenever dalapon was used. The other herbicides were not effective on foxtail when used alone, but Avadex applied in combination with 2,4-D or MCPA appeared to have reduced the stand by 60%. (Contributed by the Agronomy Department of South Dakota State College, Brookings, S. Dak.).

Herbicides	Lb/a	Flax yield % of ck	Alfalfa stand % of ck	Per cent Wild oats	Control Foxtail
Untreated	----	100	100	0	0
Avadex	1 1/4	138	93	71	30
2,4-D amine	1/4	109	80	-29	0
MCPA amine	1/4	120	18	3	0
Dalapon	1	88	73	-9	95
Avadex-2,4-D	1 1/4-1/4	126	87	83	63
Avadex-MCPA	1 1/4-1/4	145	60	75	60
Avadex-dalapon	1 1/4-1	102	97	84	98
Avadex-2,4-D-dalapon	1 1/4-1/4-1	77	93	76	98
Avadex-MCPA-dalapon	1 1/4-1/4-1	101	47	21	99
Amiben	3	152	17	8	0

Amiben and combinations of 2,3-dichloroallyl diisopropylthiocarbamate (Avadex) with 2,4-D or MCPA applied to spring wheat, underseeded with alfalfa, and barley. Derscheid, Lyle A., Wallace, Wilford H. and Wrage, Leon. Quadruplicate 10 x 30-ft. plots of Selkirk wheat underseeded with Ranger alfalfa and 10 x 30-ft. plots of Liberty barley naturally infested with wild oats (0.3 plants/sq. ft. in wheat and 2 per sq. ft. in barley), green and yellow foxtails, wild mustard and other broad-leaved annual weeds were sprayed with amiben alone and with Avadex, 2,4-D and MCPA alone and in all combinations that included Avadex. Avadex at 1 1/4 lb/A and amiben at 2 and 3 lb/A were applied and incorporated with a spike-tooth harrow on the wheat experiment on April 28. The crops were seeded April 29. Barley was seeded April 26. Amiben and Avadex were applied and incorporated with spike-tooth harrow April 29. MCPA amine 1/4 lb/A and 2,4-D amine 1/4 lb/A were applied June 15 when small grains were in 4- to 5-leaf stage of growth. All treatments were applied in 12 gal/A of spray. Wild oats stand counts were made on 20-ft. x 6-inch belt transects July 7 for the barley and July 11 for the wheat. Barley yield samples were harvested July 26 and wheat samples on August 3. Alfalfa stand estimates were made August 15. The treatments and data are as follows:

Herbicides	Lb/A	Wheat			Barley	
		Crop yield % of ck	Per cent Wild oats control	Alfalfa stand % of ck	Crop yield % of ck	Per cent wild oats control
Untreated	-	100	0	100	100	0
Avadex	1 1/4	87	-100	+25*	97	90
2,4-D amine	1/4	96	0	85	98	61
MCPA amine	1/4	102	-187	15	104	27
Avadex-2,4-D	1 1/4-1/4	81	-100	+50*	103	93
Avadex-MCPA	1 1/4-1/4	84	0	+25*	96	93
Amiben	2	104	-25	62	79	14
Amiben	3	94	-63	46	67	3

*Full stand but 25 or 50 per cent taller than that in untreated plot.

In the wheat experiment the thin stand of wild oats in the untreated plots made it difficult to establish that any treatment reduced the stand of this weed. Avadex reduced the yield of wheat and this damage may have reduced competition on alfalfa so that it produced more growth. In the barley experiment the use of Avadex, 2,4-D or MCPA alone or in combination had little effect on crop yield, however, Avadex appeared to have reduced wild oats stands by at least 90 per cent. Amiben delayed maturity of both small grain crops, reduced the stand of alfalfa, reduced the yield of barley and killed very few wild oats. (Contributed by the Agronomy Department of South Dakota State College, Brookings, S. Dak.)

Combinations of barban with 2,4-D or MCPA applied to spring wheat and barley. Derscheid, Lyle A., Wallace, Wilford H. and Wrage, Leon. Quadruplicate 10 x 50 ft. plots of Selkirk wheat and Liberty barley naturally infested wild oats (99/sq. ft. in wheat and 7.5 in barley), yellow and green foxtails, wild mustard and other broad-leaved annual weeds were sprayed with the above herbicides alone and in all combinations that included barban. The wheat was seeded April 29 and the barley April 26. On May 23, barban 1/3 lb/A was applied in 5 gal/A of spray when wild oats was in 2-leaf stage in wheat and 1 1/2-leaf stage in barley. MCPA amine 1/4 lb/A and 2,4-D amine 1/4 lb/A were applied separate from barban in 5 gal/A of spray on some barban treated plots the same day. MCPA and 2,4-D were applied in 12 gal/A of spray to other barban treated plots and untreated plots on June 8 when grain was in 4- to 5-leaf stage of growth. Wild oats counts were made on 20-ft. x 6-inch belt transects July 7. Grain yield samples were harvested from 2 x 25 ft. areas of each plot Aug. 3. The per cent of wild oats control and the grain yields are given below.

		Wheat		Barley	
Herbicides	Lb/a	Crop yield % of ck	Per cent wild oats control	Crop yield % of ck	Per cent wild oats control
Untreated	---	100	0	100	0
Barban*	1/3	112	32	90	83
Barban-2,4-D*	1/3-1/4	115	16	102	72
Barban-MCPA*	1/3-1/4	115	32	102	57
Barban-2,4-D**	1/3-1/4	103	35	104	44
Barban-MCPA**	1/3-1/4	92	52	106	37
2,4-D amine	1/4	104	11	93	-6
MCPA amine	1/4	101	20	93	-15

* 2,4-D and MCPA applied same day as barban - wild oats in 1 1/2- and 2-leaf stage.

** 2,4-D and MCPA applied later - grain in 4- to 5-leaf stage.

Barley yields were not seriously affected by any treatment, however, wheat yields tended to be higher on plots treated with barban even though wild oats stands were not reduced more than one-third. It is hypothesized that a slight reduction in the heavy stand of weeds allowed the grain to produce more. Although the wheat yielded 10 to 12 bu/A, there was not enough competition to materially reduce the heavy stand of wild oats. In barley, barban gave better wild oats control, especially when 2,4-D or MCPA was applied at the same time as the barban. (Contributed by the Agronomy Department of South Dakota State College, Brookings, S. Dak.)

Three formulations of Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) for the control of wild oats in Parkland barley. Dryden, R.D. Formulations of Avadex (1) CP 15336 (4 lb/gal) (2) CP 15336 (6 lb/gal) and (3) CP 23426 (4 lb/U.S. gal) at 0, 1.0 and 1.5 lb/A in 5 gal/A of water were incorporated on summerfallow at a 3-inch depth before planting barley. Wild oats were then seeded across the plots. Plant stands at harvest were compared to the untreated check. Average check plots contained 154 barley and 71 wild oat plants per square yard.

Herbicide	Rate	Per cent reduction of plants		Yield of barley	
		Barley	Wild oats	Straw cwt/A	Grain bu/A
CP 15336	0			30.9	28.6
4 lb/gal	1.0	3	87	31.6	31.6
	1.5	23	93	36.3	40.0
CP 15336	0			28.2	29.5
6 lb/gal	1.0	24	88	33.1	31.7
	1.5	29	91	33.2	34.5
CP 23426	0			27.6	26.7
	1.0	-10	83	33.8	32.7
	1.5	4	97	33.3	34.2

*Straw and stubble

The three formulations resulted in similar effects on yields and numbers of wild oats. Barley yields were increased at 1.0 and 1.5 lb/A. Significant reductions in numbers of wild oats were obtained at each rate. CP 23426 produced the least injury to barley plants. (Contributed by the Experimental Farm, Brandon, Man.)

Three formulations of Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) for the control of wild oats in Selkirk wheat. Dryden, R.D. Formulations of Avadex (1) CP 15336 (4 lb/gal) (2) CP 15336 (6 lb/gal) (3) CP 23426 (4 lb/U.S. gal) at 0, 1.0 and 1.5 lb/A in 5 gal/A of water were incorporated with a discer at a 3-inch depth on summerfallow before planting wheat. Wild oats were then seeded across the plots. Plant stands at harvest were compared to the untreated check. Average check plots contained 106 wheat and 64 wild oat plants per square yard.

Herbicide	Rate	Per cent reduction of plants		Yield of wheat	
		Wheat	Wild oats	Straw cwt/A	Grain bu/A
CP 23426	0			14.8	8.1
	1.0	9	84	16.7	9.4
	1.5	12	93	15.0	9.4
CP 15336	0			18.0	10.3
6 lb/gal	1	59	82	14.8	8.7
	1.5	45	88	13.8	8.9
CP 15336	0			16.4	8.5
4 lb/gal	1.0	34	81	14.9	9.1
	1.5	70	96	9.3	5.9

*Straw and stubble

Wheat straw yields were decreased significantly at 1.5 lb/A with CP 15336 (4and 6 lb/gal formulations). Significant reductions in numbers of wheat and wild oat plants occurred at 1.0 and 1.5 lb/A. CP 23426 produced the least injury to wheat plants. (Contributed by the Experimental Farm, Brandon, Man.)

Applications of three formulations of barban (Carbyne) to control wild oats seeded in Parkland barley. Dryden, R.D. Three formulations of Carbyne (1) S-847 (1 lb/gal) (2) No. 2, S-847-PB(F) (2 lb/gal) and (3) No. 2A S-847-PC(F) (2 lb/gal) were applied in 5 gal/A of water at 0, 2, 4, 6 and 8 oz/A when the wild oats had produced 1-2 leaves (stage 1) and 2-4 leaves (stage 2). The spray pressure used was 40-45 psi. Wild oat plants at harvest were compared with the untreated check. (55 sq. yd.).

Herbicide	Per cent reduction in wild oat plants* at indicated rates					Yield of barley, bu/A at indicated rates				
	2	4	6	8	Mean	0	2	4	6	8
S-847										
Stage 1	40	30	67	85	56	23.4	22.0	26.8	17.0	23.3
Stage 2	15	-18	-10	5	-2	22.0	17.7	18.9	21.8	23.2
S-847-PB(F)										
Stage 1	8	43	68	83	50	21.3	24.0	23.2	26.5	23.3
Stage 2	9	11	32	24	19	22.8	20.8	22.7	26.2	21.8
S-847-PC(F)										
Stage 1	65	84	95	86	82	20.3	25.9	27.4	26.9	26.6
Stage 2	34	35	52	54	44	20.3	26.4	21.2	26.2	27.0
Mean	28	31	51	56		21.7	22.8	23.4	24.1	24.2

*Wild oat plants producing seed

Yields of barley were not significantly different between herbicides, stages or rates although yield differences were more pronounced on stage 1, particularly with Carbyne 2A. Stage 1 applications produced significantly better wild oat control than stage 2. (Contributed by the Experimental Farm, Brandon, Man.)

New formulations of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) for the control of wild oats in wheat. Friesen, H.A. Avadex E34 formulated at 6 lb/gal; CP 23426 (2,3,3-trichloroallyl diisopropylthiolcarbamate); and CP 22819 (2,3,3-trichloroallyl diisopropyldithiocarbamate) were compared with commercial Avadex using a logarithmic sprayer and a starting rate of 3 lb/A for each product. Incorporation to a depth of 2 -3 inches was made with a one-way disc directly after spraying - seeding of Thatcher wheat was done on the same day. The plot area had a very heavy natural infestation of wild oats. Moisture conditions were good at the time of treatment but the balance of the season was excessively hot and dry. This trial did not show a clear cut advantage in favor of any one of the new formulations over the commercial Avadex at the 1.5 lb/A dosage or higher but CP 23426 resulted in better kills of wild oats at the 3/4 lb/A rate. (Table on next page). (Contributed by the Experimental Farm, Lacombe, Alta.)

Formulation	Rate lb/A	% kill of W. oats plants	Wheat bu/A
Avadex(commercial)	3/4	30	22.0
CP 23426	3/4	66	23.2
CP 22819	3/4	44	16.0
Avadex E34	3/4	30	23.1
Check (average number of wild oats plants 250/sq. yd.)			

Effect of different methods of incorporation of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) on the control of wild oats in wheat. Friesen, H.A. Avadex at nil, 1 and 1.5 lb/A was sprayed on the soil in 5 gal/A of water. Incorporation of the herbicide and seeding of the Thatcher wheat was as follows: (1) seed 2 inches deep with discer, spray; harrow twice. (2) cultivate 2 inches deep with discer, seed with press drill; spray; harrow twice. (3) spray; seed 2 inches deep with discer and pack. (4) spray; incororate 2 inches deep with discer; seed with press drill 2½-3 inches deep. (5) seed with press drill; spray. (6) seed with discer; spray. (7) spray; one-way disc 3 inches deep; seed 2 inches deep with discer and pack. (8) spray; one-way disc 3 inches deep; seed with press drill 2 inches deep. Wild oats were seeded three inches deep on one-half of each plot 2 days prior to the above operations. Moisture conditions were good at and several weeks after treatment, when the weather turned excessively hot and dry. Results: Treatments 1 and 2 were outstanding in that both rates of Avadex reduced the number of wild oats plants by about 70 per cent while the numbers of wheat plants were not reduced and the yield was increased significatnly. Treatments 3 and 4 resulted in nearly as good wild oats kills, but treatment 3, where the wheat seeds were planted in treated soil resulted in a 50% reduction in numbers of wheat plants. Due to drought this significant thinning did not reduce the yield of crop. No incorporation, treatments 5 and 6, resulted in little or no kill of wild oats at 1 lb/A and only about 40 per cent kill with 1.5 lb/A. The deeper 3-inch incorporation, treatments 7 and 8 resulted in about 60 per cent kill of wild oats plants and some 20 per cent reduction in numbers of wheat plants but no reduction in yield. None of the treatments affected the yield of wheat without the wild oats competition ("Wheat only" column).

Treatment	Rate lb/A	Wild oats		Wheat		Wheat only	
		Plants	Wt(cwt)	Plants	Bu/A	Plants	Bu/A
1	0	58	10.4	153	10.9	145	15.4
	1.0	21	3.2	156	11.6	156	14.6
	1.5	18	2.9	150	13.9	140	14.6
3	1.5	31	5.6	64	11.4	79	15.6
5	1.0	55	8.0	122	10.8	128	14.2

(Contributed by the Experimental Farm, Lacombe, Alta.)

New formulations of barban and other new herbicides for the postermergence control of wild oats in wheat. Friesen, H.A. In 1961, three new formulations of barban (Carbyne) under the code designations Lot 2, Lot 2A, and S-847PH were compared with the commercial barban at dosages of nil, ¼ and ½ lb/A sprayed in 5 gal/A of water on a natural infestation of wild oats in Thatcher wheat. The new formulations differed from barban only in the amounts and kinds of emulsifier and carrier used. Other compounds included in this test were BP-3 (2,4-dichlorophenoxyethoxycarbonylethyl N-phenylcarbamate) at 1, 2, and 3 lb/A in

5 gal/A of water; Prometryne (2,4-bis(isopropylamino)-6-methylmercapto-s-triazine) at 1 and 2 lb/A and G-34361 (2-allylamino-4-chloro-6-isopropylamino-s-triazine) at 2 and 4 lb/A each in 30 gal/A of water. All treatments were applied at 3 growth stages of the wild oats, denoted as: 1½-leaf, 2½leaf and 4 leaf. Wild oats emergence was prolonged over a period of some 10 days, therefore the sprayings had to be made when the majority of wild oats were in each of the specified growth stages. As a result the control of wild oats at stages 1 and 2 with the commercial barban at 8 oz/A was considerably poorer than anticipated. At 4 oz/A the reduction in dry weight of wild oats was less than 30 per cent. At stage 3 the wild oats control was negligible. Control with Lot 2 and S-847PH was similar to barban at all stages while Lot 2A at 8 oz/A gave distinctly better control at stages 1 and 2. Wheat yields were increased only slightly as the result of this partial control of the moderate infestation. BP-3 and G-34361 resulted in no measurable control while Prometryne appeared to kill the seedlings of both wild oats and wheat, but both made a partial recovery.

Compound	lb/A	Stage	W.oats/sq. yd. Plants	Culms	W. oats Wt. Lb/A	Wheat bu/A
Barban (Commercial)	½	1½-leaf	59	128	640	24.4
Lot 2A	½	1½-leaf	40	102	440	26.2
BP-3	3	1½-leaf	114	248	1330	20.0
Unsprayed	nil		84	193	1090	18.2

(Contributed by the Experimental Farm, Lacombe, Alta.)

<u>Benzoics and other herbicides for the control of corn spurry in barley</u>. Friesen, H.A. Various herbicides were applied with a Chesterford logarithmic sprayer at a starting rate of 2 lb/A to seedling corn spurry in barley. The barley was in the 4-5 leaf stage at spraying time. Corn spurry counts were taken at 3 dosage levels: 2, 1 and ½ lb/A on each treated strip, just before and 5 weeks after spraying. Barley yields were not taken because of the uneven stand of crop. Each strip was replicated 4 times. Results: Spotty moisture supply in the surface soil probably accounted for late emergence of corn spurry on some of the strips and consequently erratic control on those treatments. The outstanding control was achieved with 2-methoxy-3,6-dichlorobenzoic acid (Banvel D), 2-(MCPP) (Compitox) and CP 18-15 (mixture of chlorinated benzoic and cresoxyacetic acids). MCPA and 2,4-D resulted in upwards of 50 to 80 per cent kill of plants in 1961 over the ½ to 2 lb/A range. This was much better control than has been obtained in the past three seasons. Similarly good control followed the use of 2,3,6-TBA (Trysben) and Celatox (mixture of 2,4-D and 2,4,5-T isomers). 4-(2,4-DB) was only slightly less effective. Banvel D and 2,3,6-TBA at 1 lb/A and over resulted in very severe stunting, sterile florets and 10-14 days delay in maturity of the barley. CP-18-15, Celatox and 2-methoxy-3,5,6-trichlorobenzoic acid (Banvel T) also visibly injured the barley but to a much lesser degree.

Compound	% kill of corn spurry plants 2 lb/A	1 lb/A	½ lb/A
Banvel D	94	97	53
Banvel T	95	50	4
Compitox	98	81	61
CP 18-15	93	71	50
2,4-D - isopropyl ester	71	68	48
Unsprayed check - plants/sq. yd.	252	348	280

(Contributed by the Experimental Farm, Lacombe, Alta.)

Experiments with 2,3-dichloroallyl diisopropylthiolcarbamate, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) 1/ were applied to 0.2-A plots April 29 at Kennedy (loam soil temp. 41°F. at 3 in.) and Robbin, Minn. (clay soil temp. 48°F. at 3 in.) to natural infestations of wild oats. A check strip was located adjacent to each treated plot. The herbicides were applied at rates from 0.75 to 1.75 lb/A with a Fargo sprayer in 4.5 gal. water at 32 psi. Incorporation consisted of 2 harrowings post-seeding, 2 harrowings, 1 harrowing, disking 2 in. and cultivating at 2 in. and 4 in. pre-seeding, the same day of application. The areas were seeded to Selkirk wheat May 1 at Kennedy and to canarygrass May 6, at Robbin. Results: The estimated C (% wild oat control) and TH (% crop thinning) as verified by sq. yd. quadrat counts at Kennedy are presented below.

Rate	Pre-seeding										2h post-seeding	
	digger 2"		digger 4"		disk 2"		1h**		2h**			
lb/A	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
0.75	70	15(2*)	65	10	80	15	80	10	50	0	67	0
1.0	77	10(2*)	75	10(2*)	75	15(3*)	75	7(3*)	80	5	75	0(2*)
1.25	75	17	77	22	80	27	77	22(5*)	85	7(2*)	92	5

*= days delay in crop maturity **h = harrowing

The wild oat population at Kennedy varied from 0 to 600/sq. yd. in check strips. Extremely dry soil conditions at Robbin resulted in poor canarygrass germination accompanied by inadequate wild oat control, and the crop was plowed under. Chemical thinning of canarygrass (20%) was evident only at 1.5 lb/A or more. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)
1/ Registered trademark of the Monsanto Chemical Company, Reg. U.S. Pat. Off.

Pre-seeding applications of herbicides for wild oat control in wheat, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 1/2-A plots May 17 to a natural infestation of wild oats on stubble land of clay loam texture (temp. 48°F. at 3 in.) at Naicam, Sask. Check strips were adjacent to each treated plot. The herbicides were applied with a sprayer mounted on a tandem disk at rates from 0.5 to 1.5 lb/A in 10.3 gal. water at 30 psi. Incorporation consisted of 1 flexible harrowing, 2 harrowings, a tandem disk at 4 in. and at 2 in. Incorporation was considered inadequate with the harrow since flax straw accumulated, preventing soil penetration. Thatcher wheat and sweet clover were drilled in the area May 19. Results: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts Aug. 17, are presented below. The wild oat population varied from 100 to 1000/sq. yd. in check plots. (Table on next page.) Sweet clover was not adversely affected by any rate of either herbicide. Avadex at rates from 0.75 to 1.5 lb/A were applied by air in 1.5 gal. diesel fuel, incorporated with a disker or cultivator and seeded to Thatcher wheat at Meskinaw, Sask. Wild oat control ranged from 50% to 80% with increasing rates and thinned the stand of wheat a maximum of 15% at 1.5 lb/A. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Herbicide	Rate lb/A	Incorporation 1h C	Th	2h C	Th	disk 4" + 1h C	Th	disk 2" + 1h C	Th
Avadex	0.5	50	0	0	0	60	0	50	0
"	0.75	50	0	35	0	65	0	75	0
"	1.0	70	10	75	10	80	5	50	5
"	1.25	40	10	70	10	85	10	85	10
"	1.5	65	15	75	15	85	15	80	20
CP 23426	0.5	50	0	35	0	65	0	65	0
"	0.75	55	0	75	0	75	0	70	0
"	1.0	75	5	60	10	80	0	80	0
"	1.25	65	5	65	5	85	0	80	0
"	1.5	75	10	75	10	82	0	82	5

*h = harrowing

<u>Pre-seeding applications of herbicides for wild oat control in durum, 1961</u>. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.7-A plots April 19 to a natural infestation of wild oats on Barnes loam soil (temp 65°F. at 3 in.) at Rolette, N. D. Check strips were adjacent to each treated plot. The herbicides were applied with a Fargo sprayer at rates from 0.5 to 1.25 lb/A in 5 gal. water at 30 psi. Incorporation consisted of harrowing and a cultivator at 2 in. and 4 in. All of the plots were harrowed April 20 and seeded to Langdon durum wheat April 21. <u>Results</u>: The estimated C (% of control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts July 13 are presented below. The density of wild oats varied between 0 and 15/sq. yd. in check strips. Precipitation was less than 1.5 in during the growing season.

Herbicide	Rate lb/A	Incorporation 1 harrowing C	Th	cult. 2" C	Th	cult. 4" C	Th	nil C	Th
CP 23426	0.5	-	0	83	0	75	0	0	0
"	0.75	-	0	95	0	95	0	0	0
"	1.0	-	0	98	0	98	0	0	0
	1.25	-	0	98	0	98	0	0	10
Avadex	0.5	0	0	50	0	62	0	0	0
"	0.75	0	5	72	10	68	0	-	0
"	1.0	95	0	95	5	85	7	-	10
"	1.25	-	20	80	10	90	12	-	10

(Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

<u>Pre-seeding applications of herbicides for wild oat control, 1961</u>. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) 1/ and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 1-A plots May 23 to a natural infestation of wild oats in summerfallow on heavy clay soil at Riceton, Sask. A check strip was adjacent to each treated plot. Applications were made with a farm sprayer at rates from 0.5 to 1.25 lb/A in 4.8 gal. water at 30 psi. Incorporation consisted

of 1 flexible harrowing, 2 harrowings and diskering to a depth of 2 in. on a moderately rough, dry, soil (temp. 63°F. at 3 in.) the same day of application. The plots were seeded to Selkirk wheat May 26. Results: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts Aug. 3/61 are presented below. The wild oat density on check plots varied from 0 to 20/sq. yd.

Herbicide	Rate lb/A	Incorporation disker 2" C		1 harrowing C		2 harrowings C	
		C	Th	C	Th	C	Th
Avadex	0.5	50	10	50	0	60	0
"	0.75	67	15	43	0	75	10
"	1.0	75	17	62	15	72	15
"	1.25	77	30	50	27	62	25
CP 23426	0.5	60	5	50	5	77	0
"	0.75	77	0	60	0	90	0
"	1.0	90	5	50	0	-	0
"	1.25	85	0	67	0	90	5

Crop thinning was more marked in implement wheel tracks. Thinning of 10% was usually accompanied by a 2-day delay in maturity. Applications of Avadex and CP 23426 on additional plots at 1.25 lb/A after seeding and incorporated with a harrow did not adversely affect wheat. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.) 1/ Registered trademark of the Monsanto Chemical Company. Reg. U.S. Patent Office.

Applications of 2,3-dichloroallyl diisopropylthiolcarbamate for wild oat control, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) were applied to 1-A plots April 25 at Langdon (soil temp. 36°F. at 3 in.) and April 26 at Syre, Minn. (soil temp. 36°F. at 3 in.) to natural infestations of wild oats on loam soil. A check strip was adjacent to each treated plot. The herbicide was applied at rates from 0.75 to 1.5 lb/A in 5 gal. water at 27 psi. Incorporation consisted of a drag harrow (post-seeding), spring-tooth cultivator and single disk at Syre and flexible harrow and spring-tooth cultivator at 2 and 4 in. at Langdon the same day of application. Durum wheat was sown April 26 at Langdon and spring wheat on post-seeding applications April 26 and on pre-seeding applications April 29 at Syre. Treated plots at Langdon were worked with a liquid fertilizer applicator after regular incorporation. Results: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts, are presented below. Wheat injury was more marked in implement wheel tracks. Assessments made May 24 revealed more thinning, and wild oat control improved over those made July 28 as presented in the table below. The degree of wheat thinning at Syre occurred because wheat seed was drilled shallowly into treated soil instead of below it. (Table on next page.) (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

	Incorporation											
	Syre						Langdon					
Rate lb/A	2h post-seeding		disk 2"		cult. 2"		2h		spring-tooth cult. 2"		spring-tooth cult. 4"	
	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
0.75	50	10	62	25	70	30	50	0	50	0	50	10
1.0	75	12	75	30	50	30	90	5	90	5(2d)	50	10
1.25	75	15	50	25	60	40	92	10	90	15(d)	90	15
1.5	-	-	-	-	-	-	92	15	90	20	90	20

h=harrow; cult=cultivator

<u>2,3-dichloroallyl diisopropylthiolcarbamate for wild oat control in wheat, 1961</u>. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) were applied to 0.5-A plots April 5 on a natural infestation of wild oats on loose, clay loam (temp. 34°F. at 2 in.) at Bath, S.D. Check strips were adjacent to each treated plot. Applications were made from 0.75 to 1.25 lb/A with a Fargo sprayer in 5 gal. water at 35 psi. Incorporation consisted of tandem disking at 1 1/2 in. and 2 harrowings before and after seeding, the same day of application. <u>Results</u>: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts are presented below. The wild oat infestation on check strips varied between 0 and 100/sq. yd.

Rate lb/A	Seeded after spraying				Seeded before spraying			
	disk 1 1/2"		2 harrowings		disked 1 1/2"		2 harrowings	
	C	Th	C	Th	C	Th	C	Th
0.75	50	0	50	0	75	0	62	0
1.0	60	15	55	0	25	0	75	0(2d)
1.25	73	25	70	25(2d*)	80	15	90	10

* d = days delay in crop maturity

Best results were obtained with spraying after seeding. Yellow foxtail was not controlled at any of the rates applied. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

<u>Pre-seeding applications of wild oat herbicides in Alberta, 1961</u>. Selleck, G.W., McKenzie, D., Neame, N.D. and J.R. McDuffe. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.2-A plots May 17 to a natural infestation to wild oats on summerfallow of clay loam texture at Edmonton, Alta. Check strips were adjacent to each treated plot. The herbicides were applied with a farm sprayer from 0.75 to 1.25 lb/A and incorporated with 2 harrowings the same day. These harrowed plots and another series of plots were incorporated and seeded (variety 222 wheat) simultaneously with a one-way the following day. <u>Results</u>: The C (% wild oat control) and Th (% wheat thinning) as verified by sq. yd. quadrat counts Aug/61 are presented below. Wild oats varied between 0 to 75/sq. yd. on check strips. Yields represent a mean of 4 sq. yd. quadrats* harvested from each treatment. (Table on next page.)

Herbicide	Rate	Yield	Incorporation			
			one-way		2 harrowings	
		bu/A	C	Th	C	Th
Nil (uninfested)	0.0	21.0	0	0	0	0
Nil (infested)	0.0	10.6	0	0	0	0
Avadex	0.75	24.4	75	10	90	0
"	1.0	23.9	85	10	85	10
"	1.25	22.9	75	20	75	20
CP 23426	0.75	24.2	95	0	95	0
"	1.0	22.3	95	0	95	0
"	1.25	24.3	80	10	80	10

Incorporated with a harrow (pre-seeding) May 18 at Okotoks, Alta., Avadex and CP 23426 at 1 lb/A in 5 gal/A water provided 85% and 90% control respectively, of wild oats and 10% and 0% thinning respectively of Red Bob wheat. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri and National Grain Company Limited, Winnipeg, Man.)
*Threshed by personnel of the Plant Science Department, University of Manitoba.

Post-seeding applications of wild oat herbicides in Manitoba, 1961. Selleck, G.W. and D. McKenzie. Post-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.2-A plots May 26 to a natural infestation of wild oats on loose, moist, seeded summerfallow of clay loam texture at Balmoral, Man. A check strip was located adjacent to each treated plot. The herbicides were applied from 0.6 to 1 lb/A with a farm sprayer in 8 gal. water and incorporated with 2 and 3 harrowings the same day of seeding. Results: Injury was not evident to wheat on any of the plots, and wild oats were not controlled with either herbicide on unincorporated plots. Wheat yields and the estimated % wild oat control are presented below. Yields represent a mean of 10, sq. yd. quadrats taken for the check and each rate on incorporated plots. Variable green foxtail (Setaria viridis) stands which were not significantly controlled by either herbicide, masked to some degree the yield responses expected.

		Rate lb/A						Check
		Avadex			CP 23426			
	Incorp.	0.6	0.8	1.0	0.6	0.8	1.0	
% control	2h	98	85	95	98	90	90	0
% control	3h	98	99	95	98	99	95	0
Yield bu/A	(composite of above incorporations)	17	14	17	12	21	15	9

(Contribution from the Monsanto Chemical Company, St. Louis, Missouri and National Grain Company Limited, Winnipeg, Manitoba.)

Wild oat control with selective herbicides, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied May 8 to 0.5-A plots supporting a natural infestation of wild oats on moist summerfallow

of loam soil texture (temp. 47°F. at 3 in.) at Esterhazy, Sask. Check strips were adjacent to each treated plot. Herbicides were applied with a farm sprayer from 0.5 to 1.5 lb/A in 10 gal. water at 25 psi. Incorporation included flexible harrowing, a cultivator at 4 in. and 2 in. the same day of application, and a disker at 2 in. the following morning, the latter on extremely wet soil. Thatcher wheat was drilled into the area May 12. A total of 0.75 in. precipitation fell in 7 showers during the growing season. <u>Results</u>: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts Aug. 1/61 are presented below.

		Incorporation											
Herbicide	Rate	3h		2h		cult. 4"		cult. 2"		d2"		nil	
	lb/A	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
Avadex	0.5	50	0	0	0	0	0	0	0	0	0	50	0
"	0.75	75	0	75	0	0	10	0	10	0	0	0	0
"	1.0	75	0	75	0	50	15	0	15	0	10	0	0
"	1.3	0	10	65	10	75	25	50	25	40	25	0	-
"	1.5	-	10	-	10	50	50	80	40	50	30	0	-
CP 23426	0.5	-	0	75	0	25	0	60	0	30	0	25	0
"	0.75	-	0	75	0	60	0	75	0	60	0	25	0
"	1.0	-	0	85	0	75	0	25	0	35	0	25	0
"	1.25	-	0	75	0	85	10	70	5	85	0	50	0
"	1.5	-	0	-	0	-	10	80	10	90	0	0	0

h=harrow; cult. = cultivator; d = disker

Crop thinning was more marked in implement wheel tracks. Thinning of 40% to 50% was usually accompanied by a 7-day delay in maturity and thinning of 10% to 20 % by a 2-day delay. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

<u>2,3-dichloroallyl diisopropylthiolcarbamate for wild oat control in durum, 1961</u>. Selleck, G.W. Pre- and post-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) were applied to 1-A plots of natural infestations of wild oats on second crop land of loam soil April 19 at Leeds (soil temp 65°F. at 3 in.) and pre-seeding applications April 21 at Devils Lake, N.D. (soil temp. 40°F. at 3 in.). Check strips were adjacent to each treated plot. The herbicide was applied at rates from 0.75 to 1.5 lb/A in 5 gal. water at 30 psi. Incorporation consisted of a spring tooth cultivation, tandem disking and 2 harrowings at Devils Lake and pre-seeding harrowing, tandem disking and post-seeding harrowing at Leeds. Langdon durum wheat was seeded April 19 and 21 at Leeds, and April 23 at Devils Lake. Precipitation during the growing season was 1.5 in. at Devils Lake and 2.5 in. at Leeds. <u>Results</u>: The estimated C (% wild oat control) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts July/61 are presented below. (Table on next page.) Wild oat populations at both sites ranged from 20 to 400/sq. yd. on check strips. The durum wheat at Devils Lake was so severely droughtridden that the field was plowed under after assessment. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Rate lb/A	Leeds 2h*post-seeding		2h*pre-seeding		tandem disk 2"		Devils Lake tandem disk 2"		2h*		spring-tooth cult. 2"	
	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
0.75	50	0	-	0	0	0	80	0	75	0	50	0
1.0	70	0	0	0	35	0	50	0	60	0	60	0
1.25	75	0	40	0	0	0	-	0	60	0	65	0
1.5	65	0	75	0	0	10	65	10	75	10	50	0

*h = harrowing

Pre-planting treatments of wild oats in wheat, 1961. Selleck, G.W., McKenzie, D., and E. Tumak. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.2-A plots May 19 to a natural infestation of wild oats in moist summerfallow of loam texture (temp. 50°F. at 3 in.) at White Fox, Sask. A check strip was adjacent to each treated plot. The herbicides were applied at rates from 0.75 to 1.25 lb/A with a farm sprayer in 4 gal. water at 30 psi. Incorporation consisted of a tandem disk and 2 flexible harrowings the same day of spraying. The field was seeded to wheat May 21. Results: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts Aug. 19 are presented below. Yield determination was based on inadequate sampling, 2 sq. yd. plots collected from each rate and sent to the Department of Plant Science, University of Manitoba, for threshing. Wild oat density varied between 0 and 200/sq. yd. Crop injury was most evident in implement wheel tracks.

Herbicide	Rate lb/A	Yield bu/A	Incorporation 2 harrowings C	Th	tandem disk 2" C	Th	no incorp. C	Th
Avadex	0.5	20.5	75	0	75	10	50	10
"	1.0	18.5	80	15(2d)	85	10	50	10
"	1.25	15.4	87	20(7d)	80	15	57	12
CP 23426	0.5	18.3	85	0	85	0	67	0
"	0.6	17.7	80	0	75	0	65	0
"	1.0	16.4	95	7	-	-	70	5
Clean check	0	24.5	0	0	0	0	0	0
Dirty check	0	3.3	0	0	0	0	0	0

d = days delay in maturity.

(Contribution from the Monsanto Chemical Company, St. Louis, Missouri and the National Grain Company, Ltd., Winnipeg, Manitoba.)

Selective control of wild oats in wheat, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avedex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.5-A plots May 20 to a natural infestation of wild oats on compact summerfallow of sandy loam texture (temp. 78°F. at 3 in.) at Nipawin, Sask. A check strip was adjacent to each treated plot. The herbicides were applied at rates from 0.5 to 2.4 lb/A with a farm sprayer in 5.5 gal. water at 30 psi. Incorporation consisted of combinations of the cultivator, diamond harrow and rod weeder the same day of application. Thatcher wheat was drilled May 24. Results: The estimated C

(% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts Aug. 18/61, are presented below.

Herbicide	Rate lb/A	Incorporation: Cult. + 1 H		Cult. 2"		Cult. 2" + R. W.		Cult + R. W. + 1 H	
		C	Th	C	Th	C	Th	C	Th
Avadex	0.6	0	0	50	0	-	0	-	0
"	1.0	95	0	-	0	-	0	-	0
"	1.4	95	0	-	0	-	0	-	0
"	1.8	85	5	90	0	0	0	-	5
"	2.4	95	15	97	10	92	12	-	12
CP 23426	0.5	90	0	90	0	90	0	-	0
"	0.65	-	0	-	0	90	0	90	0
"	0.83	90	0	95	0	45	0	74	0
"	1.2	92	0	92	0	90	0	-	0

Cult. = cultivator; R. W. = rod weeder; H = harrow

Wild oats varied between 0 and 30/sq. yd in check strips. Wheat thinning was confined entirely to moist potholes. Applications of CP 23426 at 1.2 lb/A, Avadex at 1.5 and 2.0 lb/A and incorporated with a cultivator, rod weeder and harrow controlled wild oats 98%, 90% and 95% respectively, without injury to Redwing flax. Avadex at 1.5, 1.75 and 2 lb/A applied in 1960 significantly decreased hawksbeard (Crepis tectorum) stands in 1961. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

<u>Pre- and post-seeding application experiments with 2,3-dichloroallyl diisopropylthiolcarbamate, 1961</u>. Selleck, G.W. Pre- and post-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) were made to 0.8-A plots April 29 at Argusville (soil temp. 40°F. at 3 in.) and pre-seeding applications May 2 at Durbin, N. D. (soil temp. 47°F. at 3 in.). A check strip was adjacent to each treated plot. The herbicides were applied to clay loam soil at rates from 0.75 to 1.5 lb/A with a Fargo sprayer in 4.5 gal. water at 28 psi. Incorporation was done with a flexible harrow before and after seeding at Argusville and after seeding at Durbin the same day of application. <u>Results</u>: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts July/61 are presented below. Selkirk spring wheat was sown April 22 and April 29 at Argusville and May 4 at Durbin. The wild oat population varied between 0 and 800/sq. yd. at Argusville and 0 and 0 and 500/sq. yd. at Durbin. Precipitation during the growing season was 2 in. or less at both locations. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Rate lb/A	Argusville: 2h* post-seeding		1h*		2h*		Durbin: 1h*		2h*		3h*	
	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
0.75	70	0	50	15	50	10	70	10	75	10	75	10
1.0	75	0	50	20	65	25	50	0	77	10	72	12
1.25	70	10	50	10	50	25	50	0	65	10	75	10
1.5	85	10	65	20	50	25	-	15	80	10	80	10

*h = harrowing

Pre- and post-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) were applied to 1-A plots May 8 at Neche and pre- and post-seeding applications at Buxton April 28 (soil temp. 48°F. at 3 in.) to natural infestations of wild oats on clay loam soil. Check strips were adjacent to each treated plot. The herbicide was applied from 0.75 to 1.5 lb/A with a Fargo sprayer in 4 gal. water at 28 psi. Incorporation consisted of a spring-tooth cultivator, tandem disk and Melroe harrow at Buxton, and disking at 2 and 4 in. and post-seeding harrowing at Neche, the same day of application. Selkirk wheat was seeded the day following spraying. Results: The estimated C (% wild oat control) and Th (% crop thinning) as verified by sq. yd. quadrat counts July/61 are presented below. Moisture was in good supply at the time of seeding at Buxton and 2 in. of rain fell prior to July 10. At Neche, only 0.2 in. of rain fell from seeding time to July 22. The wild oat infestation at both locations varied between 0 and 180/sq. yd. in check strips.

	Buxton						Neche					
Rate	2H		disk 2"		spring-tooth cult.4"		2h post-seeding		disk 2"		disk 4"	
lb/A	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
0.75	75	10	80	15	0	17	50	0	25	0	50	0
1.0	85	17	90	22	92	17	60	0	60	0	50	10
1.25	85	25	80	32	85	30	67	0	75	10	70	10
1.5	-	-	-	-	-	-	75	0	50	10	70	12

h = harrowing cult. = cultivator
(Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Pre- and post-seeding experiments with 2,3-dichloroallyl diisopropylthiolcarbamate, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) were applied to 1-A plots on loam soil April 13 at Turtle Lake (soil temp. 42°F. at 3 in.) and post- and pre-seeding applications April 20 at Richardton, N.D. Check strips were adjacent to each treated plot. The herbicide was applied at rates from 0.75 to 1.5 lb/A with a Fargo sprayer in 5 gal. water at 30 psi. Incorporation consisted of a cultivator at 2 in. and a disk at 2 and 4 in. at Turtle Lake and 2 harrowings and a disk in both pre- and post-seeding applications at Richardton. The plots were seeded to Selkirk wheat the same day of spraying, on pre-seeding applications and 4 days prior to spraying on post-seeding applications. Results: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts July/61 are presented in the following table. The wild oat population in check strips varied between 0 and 180/sq. yd. at Richardton and between 0 and 200/sq. yd. at Turtle Lake. (Table on next page.)
(Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

	Turtle Lake						Richardton							
	Pre-seeding						Post-seeding				Pre-seeding			
Rate lb/A	Cult. 2"		disk 4"		disk 2"		disk 2"		2h		disk 2"		drilled only	
	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
0.75	90	15	80	15	-	10	50	0	0	0	60	10	50	12
1.0	85	30	90	25	-	22	70	10	75	0	62	10	75	12
1.25	82	30	-	35	95	30	90	15	90	0	60	10	60	10
1.5	95	35	95	50	95	40	-	-	-	-	-	-	-	-

h = harrowing cult. = cultivator

<u>Pre- and post-seeding applications of herbicides for wild oat control in wheat, 1961</u>. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied on 0.5-A plots to a natural infestation of wild oats on loam soil (temp. 45°F. at 3 in.) April 22 at McVille, N.D. Check strips were located adjacent to each treated plot. Herbicides were applied at rates from 0.5 to 1.5 lb/A with a Fargo sprayer in 4.5 gal. water at 30 psi. Post-seeding incorporation consisted of 2 harrowings on plot sown to Langdon durum and pre-seeding incorporation of 1 harrowing, disking at 2 in. and cultivating at 2 in. and 4 in. and seeding to Selkirk wheat the same day of application. <u>Results</u>: The estimated C (% wild oat control) and Th (% thinning) as verified by sq. yd. quadrat counts July/61 are presented below.

Herbicide	Rate	post-seeding		(		pre-seeding					)
		2h**		1h**		cult. 2"		cult. 4"		disk 2"	
	lb/A	C	Th	C	Th	C	Th	C	Th	C	Th
CP 23426	0.5	75	0	70	0	90	0(2*)	80	0(2*)	85	0(2*)
"	0.75	80	0	80	0(2*)	90	5(2*)	90	0(2*)	92	0(2*)
"	1.0	90	0	90	0(2*)	95	5(2*)	95	5	90	10(2*)
"	1.25	85	0	90	5(2*)	95	5(2*)	90	5(1*)	92	7(2*)
Avadex	0.5	55	0	50	0	60	0	75	0	70	0
"	0.75	65	0	75	0	65	0	80	5(1*)	80	5
"	1.0	77	10	75	10(2*)	80	10(2*)	80	12(2*)	82	12(2*)
"	1.25	82	20(2)	75	15(4)	82	20(3*)	82	20(3*)	78	22(5*)
"	1.5	81	17(1)	85	15(1)	75	25(3*)	80	35(4*)	80	35(1*)

* = days delay in crop maturity; **h = harrowing

One harrowing improved wild oat control a mean of 26% with Avadex and 15% with CP 23426 over no incorporation. Injury to spring wheat was more prevalent in implement wheel tracks and in moist depressions. A mean of all applications with CP 23426 at 0.5, 0.75, 1.0, and 1.25 lb/A resulted in increased yields of 2.7, 15.5, 18.9 and 13.5% respectively over the check. Wheat yields with Avadex at 0.5 lb/A, 1.0 and 1.5 lb/A differed from the check by +4.8, 0.0 and -10.5% respectively. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

<u>Pre- and post-seeding applications of herbicides for wild oat control in wheat and durum, 1961</u>. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl

diisopropylthiolcarbamate (Avadex) and 2,3,3-trichlorallyl diisopropylthiolcarbamate (CP 23426) were applied May 13 at Beadle, Sask., to 0.5-A plots supporting a natural infestation of wild oats on moist, medium-rough, summer-fallow of clay soil texture (temp. 49°F. at 3 in.) and incorporated with a disker at 2 in. and 4 in. simultaneous to seeding. Post-seeding applications 3 days after seeding to Ramsay durum on moist, firm, trashy stubble land, were incorporated with a combination of packing and diamond harrowing. A check strip was adjacent to each treated plot. The herbicides were applied from 0.55 to 2.0 lb/A with a farm sprayer in 6.3 gal. water at 22 psi. Incorporation with the harrow was considered inadequate since trash accumulated, preventing soil penetration. Results: The estimated C (% control of wild oats) and Th (% thinning of crop) as verified by sq. yd. quadrat counts Aug. 6 are presented below:

		Incorporation											
Herbicide	Rate	2" d		4" d		1p		1h+ 1p		2h+ 1p		3h+ 1p	
	lb/A	C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
CP 23426	0.55	90	0	75	5	-	-	-	-	-	-	-	-
"	0.80	95	5	75	10	90	0	95	0	90	0	82	0
"	1.1	87	10	95	15	80	0	87	0	85	0	85	0
"	1.4	95	15	92	15	72	0	85	0	85	0	85	0
"	2.0	92	25	90	30	85	0	87	0	87	0	83	0
CP 15336	0.5	62	0	25	5	-	-	-	-	-	-	-	-
"	0.75	75	7	75	10	75	0	50	0	50	0	35	0
"	1.0	85	5	82	17	62	0	-	0	-	0	75	0
"	1.25	92	20	80	27	25	0	25	0	-	0	62	0
"	1.5	95	25	90	30	50	10	65	10	82	10	85	10

d = disker; p = packer; h - diamond harrow

Wild oats varied from 25 to 100/sq. yd. in check strips. Crop thinning was more marked in implement wheel tracks. Thinning of 10% was usually accompanied by a 2-day delay in maturity. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Pre- and post-seeding application of two herbicides for wild oat control, 1961. Selleck, G.W., McKenzie, D., and W.R. Stevens. Pre- and post-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.2-A plots May 16 to a natural infestation of wild oats on summerfallow of heavy clay texture at Estlin, Sask. A check strip was located adjacent to each treated plot. Herbicides were applied from 0.75 to 1.25 lb/A in 4 gal/A water and incorporated as follows: no incorporation, 2 harrowings (after seeding Selkirk wheat) and simultaneous seeding and incorporation with a disker after spraying. Results: The estimated C (% wild oat control) and Th (% wheat thinning) as verified by sq. yd. quadrat counts Aug/61 are presented below. Wild oat density varied from 0 to 20/sq. yd. in check strips. Post-seeded plots with Avadex and CP 23426 at 1.25 lb/A yielded 28.4 and 32.9 bu/A, respectively. Pre-seeded plots with CP 23426 at 1.25 lb/A and the check yielded 29.2 and 22.5 bu/A, respectively. Four sq. yd. samples were harvested from these treatments and sent to the Department of Plant Science, University of Manitoba, for threshing. (Table on following page.)

Herbicide	Rate lb/A	Incorporation: disker + 1 harrowing		2 harrowings post seeding		Nil	
		C	Th	C	Th	C	Th
Avadex	0.75	75	10	75	0	0	0
"	1.0	-	20	75	0	50	5(2d*)
"	1.25	90	25(7d*)	90	0	50	0
CP 23426	0.75	85	0	-	0	-	0
"	1.0	-	0	85	0	-	0
"	1.25	90	5	90	0	-	0

*d = days delay in maturity

(Contribution from the Monsanto Chemical Company, St. Louis, Missouri and the National Grain Company Limited, Winnipeg, Man.)

<u>Pre- and post-seeding applications of herbicides for wild oat control, 1961</u>. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.5-A plots May 16 to a natural infestation of wild oats on compact, moist summerfallow and stubble land on loam soil (temp. 49°F. at 3 in.) at Spalding, Sask. Check strips were adjacent to each treated plot. The herbicides were applied with a farm sprayer from 0.5 to 1.5 lb/A in 4.1 gal. water at 30 psi. Incorporation was done with a disker on stubble and a flexible harrow on summerfallow the same day of application. Thatcher wheat was sown May 10 on post-seeding applications and May 17 on pre-seeding ones. A total of 1 in. of precipitation fell during the growing season in 8 brief showers. <u>Results</u>: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrats Aug. 15 are presented below.

Herbicide	Rate lb/A	Incorporation: d 2"		d 4"		3h		2h		1 h		nil	
		C	Th	C	Th	C	Th	C	Th	C	Th	C	Th
CP 15336	0.5	-	0	50	0	50	0	50	0	55	0	0	0
"	0.75	-	0	50	0	60	0	65	0	0	0	0	0
"	1.0	75	0	65	0	75	0	70	0	25	0	0	0
"	1.25	75	0	60	0	65	0	65	0	50	0	0	0
"	1.5	75	0	75	10	75	0	75	0	50	0	0	0
CP 23426	0.5	50	0	-	0	65	0	80	0	50	0	0	0
"	0.75	90	0	-	0	75	0	90	0	50	0	40	0
"	1.0	90	0	90	0	85	0	85	0	60	0	0	0
"	1.25	-	0	95	5	90	0	90	0	80	0	25	0
"	1.5	90	0	95	10	95	0	95	0	75	0	50	0

D = disker; H = harrow

Wild oat density in the check strips varied between 25 and 300/sq. yd. CP 15336 applied at 1.5 lb/A just prior to emergence of Thatcher wheat and incorporated with a harrow had no adverse effects on wheat. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Pre-seeding applications of two herbicides for wild oat control, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.5-A plots May 4 to a natural infestation of wild oats on clay loam soil (temp. 57°F. at 3 in.) at Mahnomen, Minn. A check strip was adjacent to each treated plot. The herbicides were applied at rates from 0.5 to 1.5 lb/A with a Fargo sprayer in 5 gal. water at 30 psi. Incorporation consisted of disking at 2 in. and 4 in. and 1, 2, and 3 melroe harrowings. Selkirk wheat was sown May 5. Results: The estimated C (% wild oat control) and Th (% wheat thinning) as verified by sq. yd. quadrat counts July/61 are presented below. Approximately 1.5 in. of rain fell between May 5 and July 10.

Herbicide	Rate lb/A	Incorporation 3h** C	Th	2h** C	Th	1h** C	Th	disk 2" C	Th	disk 4" C	Th
CP 15336	0.5	0	0	25	0	0	0	60	0	0	0
"	0.75	25	0	60	0(2*)	60	0	50	0(2*)	25	0(2*)
"	1.0	60	15(5*)	50	10(3*)	50	0(2*)	50	10(2*)	50	10(2*)
"	1.25	60	20(5*)	50	15(5*)	50	0(3*)	60	12(3*)	75	10(5*)
"	1.5	50	30	50	25	50	10(3*)	75	15(5*)	60	15(5*)
CP 23426	0.5	70	0	60	0	50	0	60	0	60	0
"	0.75	60	0	50	0	0	0	50	0	25	0
"	1.0	90	0	80	0	65	0	75	0(2*)	85	0
"	1.25	35	15	75	0	50	0(2*)	75	0(2*)	80	0
"	1.33	75	15	55	0	45	0	75	0	85	0

**h = harrowing * = days delay in crop maturity

CP 23426 applied at 1.3 lb/A and seeded to flax and domestic oats 3 weeks later controlled wild oats 80% with 20% thinning to domestic oats and no injury to flax. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Pre-seeding applications of two herbicides for wild oat control in barley, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied to 0.5-A plots April 24 to a natural infestation of wild oats on second crop land in sandy loam soil (temp. 48°F. at 3 in.) at Park River, N.D. A check strip was located adjacent to each treated plot. The herbicides were applied at rates from 0.5 to 2 lb/A with a Fargo sprayer in 5 gal. water at 30 psi. Incorporation consisted of 1, 2 and 3 drag harrowings, disking at 2 in. and cultivating at 2 in. Trail barley was sown April 30. Virtually no rain fell between April 24 and July 1. Results: The barley was too poor to harvest because of inadequate moisture, and the wild oat infestations were sparse on check strips. Wild oat control varied between 75 and 95% with both herbicides. Crop thinning (10% or less) was confined to wheel tracks with Avadex applications at 1.25 and 1.5 lb/A. Avadex and CP 23426 were applied at 1.5 lb/A, incorporated with 2 harrowings and a tandem disk and seeded to Gary oats and Selkirk wheat. The % thinning of oats and wheat are presented below.

Incorporation	Herbicide: Avadex wild oats	domesticated oats	wheat	CP 23426 wild oats	domesticated oats	wheat
Tandem disk	95	90	20	95	95	5
Harrow	95	60	10	95	75	0

(Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Wild oat control in barley with 2,3-dichloroallyl diisopropylthiolcarbamate, 1961. Selleck, G.W. Pre-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) were applied to 1-A plots on loose, loam soil, April 5 at Doland, S.D. (soil temp. 34°F. at 2 in.) and April 8 at Sisseton, S.D. (soil temp. 50°F. at 2 in.). Check strips were adjacent to each treated plot. Applications were made with a Fargo sprayer from 0.7 to 1.5 lb/A in 5 gal. water at 35 psi. Incorporation consisted of disking at depths of 2 in. and 4 in. at Sisseton and 2 drag harrowings vs 1 harrowing at Doland. Plots were seeded to Kindred barley April 15 at Doland, and Trail barley April 10 at Sisseton. Results: The estimated C (% wild oat control) and Th (% barley thinning) as verified by sq. yd. counts July 3-4/61 are presented below. The wild oat population varied from 100 to 400/sq. yd. at Sisseton and from 0 to 25/sq. yd. at Doland on check strips.

Rate	Doland				Sisseton			
	2 harrowings		1 harrowing		disk 2"		Disk 4"	
	C	Th	C	Th	C	Th	C	Th
0.7	60	0	60	0	62	0	70	0
0.9	-	-	-	-	63	0	70	0
1.0	65	0	65	0	60	0	75	0
1.3	70	10	65	10	80	0	90	0
1.5	90	10(2d*)	75	10(2d*)	-	-	-	-

*d = days delay in maturity of crop

Yellow foxtail was not controlled at either location with any of the rates used. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Selective control of wild oats in various crops, 1961. Selleck, G.W. Pre- and post-seeding applications of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) were applied to 1-A plots April 17 at Jamestown, N.D. (loam soil, temp. 42°F. at 3 in.) and post-seeding applications at Grand Forks, N.D. (clay loam soil, temp. 48°F. at 3 in.) May 1. Applications were made from 0.5 to 1.5 lb/A with a Fargo sprayer in 5 gal. water at 30 psi, and harrowed the same day. Selkirk wheat was seeded April 17 and 18 at Jamestown and April 13 at Grand Forks. Results: The estimated C (% control of wild oats) and Th (% thinning of wheat) as verified by sq. yd. quadrat counts at Jamestown are presented below. Wild oat densities in check strips varied between 0 and 40/sq. yd. at Grand Forks and between 0 and 25/sq. yd. at Jamestown. Rates from 0.75 to 1.5 lb/A and incorporated with 3 harrowings at Grand Forks controlled wild oats from 85 to 95% without injury to wheat. Wild oats were absent on check plots adjacent to incorporations with 1 and 2 harrowings at Grand Forks preventing assessments.

Rate lb/A	Post-seeding application				Pre-seeding application			
	2 harrowings		1 harrowing		2 harrowings		1 harrowing	
	C	Th	C	Th	C	Th	C	Th
0.75	95	0	95	0	90	5	95	7
1.0	95	0	95	0	95	15	95	30
1.25	92	0	97	5	93	25	95	30
1.5	95	12	90	7	90	45	87	47

Avadex at 1.5, 1.75 and 2 lb/A applied pre-planting of potatoes, post-planting of sugar beets and peas (incorporated with 2 or more harrowings) at Grand Forks provided 80 to 95% wild oat control without crop injury. (Contribution from the Monsanto Chemical Company, St. Louis, Missouri.)

Control of wild oats in wheat with preemergence herbicides, 1961. Skoglund, N.A. and R.T. Coupland. Two formulations of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) containing 4 lb/standard gal. and 6 lb/Imperial gal. and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) containing 4 lb/standard gal. were applied with a logarithmic sprayer at an initial rate of 4 lb/A to silty clay loam soil at Saskatoon on May 16 in 13.6 Imperial gpa of water. Incorporation was carried out immediately afterwards with disc harrows at a depth of about 1 in. on one sub-block and at 2 to 2.5 in. on the other. Thatcher wheat and wild oats were seeded about two hours later at 90 lb. and 15 lb/A, respectively, at a depth of 1.5 to 2 in. The plan provided for duplicate plots, each 15 x 200 ft., of each treatment. Drought and insect damage caused the stand of crop to be only about 25 percent of normal density, but the stand of wild oats in the checks averaged 9 plants/sq. yd. Sample counts of the numbers of wild oat plants and spikes of wheat gave the percentage control of the weed and damage to the crop as follows:

Crop, rate, and incorporation	Avadex 4 lb/gal	Avadex 6 lb/gal	CP 23426
Wild oats			
Incorporation to 1 in.			
4 lb/A	100	100	100
2 lb/A	100	95	100
1 lb/A	100	75	55
0.5 lb/A	100	0	0
Incorporation to 2 in. and over			
4 lb/A	75	100	100
2 lb/A	50	100	100
1 lb/A	75	50	50
0.5 lb/A	0	0	0
Wheat			
Incorporation to 1 in.			
4 lb/A	100	-	-
2 lb/A	100	43	57
1 lb/A	85	40	0
0.5 lb/A	0	0	0
Incorporation to 2 in. and over			
4 lb/A	66	100	100
2 lb/A	58	100	100
1 lb/A	58	56	50
0.5 lb/A	0	0	0

The maximum lb/A at which no effect was obtained is shown on table on next page. Under these conditions the regular formulation of Avadex (4 lb/gal) apparently was most effective in controlling the weed. The extensive damage to wheat under the conditions of the test was possibly the result of a complementary effect of heat, drought and herbicide, rather than herbicide alone. Dead seedlings from 1 to 2 in. long were readily uncovered between the thin stand of growing shoots.

Shallow incorporation seemed to be more effective on the wild oats and tended to cause less damage to wheat than deeper incorporation. (Contribution No. 316 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Monsanto Chemical Company.)

Depth of incorporation	Avadex 4 lb/gal	Avadex 6 lb/gal	CP 23426
Wild oats			
1 in.	0.25	0.85	0.65
2 in. and more	0.80	0.75	0.75
Wheat			
1 in.	0.55	0.85	1.0
2 in. and more	0.75	0.8	0.9

Control of wild oats by pre-emergence herbicides at Naicam, 1960. Skoglund, N.A. and R.T. Coupland. Twenty-four plots, 15 x 200 ft., on clay loam soil were sprayed on May 16 at an initial rate of 4.8 lb/A of each of the following herbicides in 13 Imperial gal. of water, using a logarithmic sprayer: 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex), 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426), 2,3,3-trichloroallyl diisopropyldithiocarbamate (CP 23411), and 2-chloroallyl diisopropyldithiocarbamate (CP 7667). These herbicides were incorporated by double discing and plots were seeded the following day to Thatcher wheat and Husky barley, and on May 20 to Polish rape, so as to provide duplicate treatments of each herbicide on each crop. Rain after spraying caused soil to be slightly sticky, which interfered with incorporation and possibly accounted for poor control in some plots. The infestation of wild oats in checks averaged 34 plants per sq. yd. and ranged from 0 to 125/sq. yd. The percentage control of wild oats by each treatment was recorded (by plant counts) on Aug. 11-12 as follows:

Crop	Rate (lb/A)	Herbicide			
		Avadex	CP 23426	CP 23411	Cp 7667
Barley	4.3	65	100	92	90
	3.3	83	-	-	85
	2.2	59	90	90	82
	1.7	-	85	68	-
	1.1	65	80	-	75
	0.8	-	70	55	-
	0.7	50	50	-	0
Wheat	4.3	80	100	76	100
	3.3	-	-	-	35
	2.2	75	100	66	-
	1.7	-	100	-	-
	1.3	-	75	-	-
	1.2	80	0	20	15
	1.1	60	0	0	0
Rape	4.3	95	100	100	30
	2.2	85	95	85	0
	1.7	67	-	-	0
	1.2	77	90	-	-
	1.1	70	85	55	-
	0.8	-	0	-	-

Significantly better control was obtained by CP 23426 than with Avadex. Wheat suffered damage from treatment with Avadex at 2.2 lb/A (10 percent reduction in number of heads) and above (30 percent at 3.1 to 4.3 lb/A). CP 23426 and CP 7667 caused 32 percent and 5 percent damage, respectively, at 4.3 lb/A, but this disappeared at 3.3 lb/A. No effect was observed on barley, except for a delay of a few days in maturity at the heaviest rates of Avadex and CP 23426. Rape was unaffected. (Contribution No. 317 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Monsanto Chemical Company.)

Control of wild oats by pre-emergence herbicides at Saskatoon, 1961. Skoglund, N.A. and R.T. Coupland. 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were applied by spray on silty clay loam soil at 1.5 and 3 lb/A in 32 Imperial gal. of water as a pre-emergence treatment in 15 x 100 ft. plots sown to wild oats (15 lb/A) and overseeded to wheat and to barley on May 17, 1961. Drag harrowing and disc harrowing were compared as methods of incorporation. The crops and weeds began emerging on May 25. The infestation of wild oats in checks averaged 8 plants/sq. yd., but the stand of the crop was very thin (due to drought). The effects of the treatments were recorded (by plant counts of weed and head counts of crop) on July 26 as follows:

	Incorporated drag harrows		Incorporated disc harrows	
	Avadex	CP 23426	Avadex	CP 23426
In wheat crop				
Percent control of wild oats at				
1.5 lb/A	98.0	99.8	98.0	100.0
3 lb/A	99.0	100.0	98.6	100.0
Percent damage to crop at				
1.5 lb/A	18	28	30	-*
3 lb/A	8	46	30	-*
In barley crop				
Percent control of wild oats at				
1.5 lb/A	96.9	98.9	-*	98.3
3 lb/A	98.8	99.7	-*	98.6
Percent damage to crop at				
1.5 lb/A	0	0	-*	0
3 lb/A	0	10	-*	0

*Damaged by grasshoppers.

CP 23426 was consistently slightly more effective than Avadex in controlling wild oats, but gave some evidence of being more destructive to wheat. This latter unfavorable performance may have been associated with the post-seeding method of application or with the dry conditions which resulted in a very poor stand of (25 to 30 percent of normal density) of crop. No difference was observed between methods of incorporation. (Contribution No. 318 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Monsanto Chemical Company.)

Mixtures of barban and MCPA for the control of wild oats, 1961. Skoglund, N.A. and R. T. Coupland. Duplicated plots (15 x 200 ft.) of barley infested with wild oats on silty clay loam soil were sprayed at Borden, Sask. with barban,

mixtures of barban and the butyl ester of MCPA, and with BP3 (2,4-dichlorophenoxyethoxycarbonylethyl N-phenylcarbamate) using an initial rate of 2 lb/A in a logarithmic sprayer delivering 13.6 Imperial gpa. These applications were made on June 24 when wild oats mostly ranged from the 1- to 3-leaf stage and the barley (sown May 31) was 2 to 3 in. high. The infestation of wild oats on the checks averaged 14 plants per sq. yd. The results were as follows:

Herbicide	Barban	2 barban: 1 MCPA	1 barban: 1 MCPA	BP3
Percent control of wild oats at				
2 lb/A	100	100	89	34
1 lb/A	95	25	0	0
0.5 lb/A	60	0	0	-
Maximum rate (oz/A) resulting in no control	5	15	21	26

The effectiveness of barban and barban mixtures in controlling wild oats decreased with the proportion of barban contained. A 12 percent decrease in number of heads resulted at the 2 lb. rate of barban, while some stunting of barley was observed down to 1.25 lb/A. Delay in maturity of barley of a few days resulted from barban and barban-MCPA mixtures in excess of 1 lb/A. BP3 was less effective than barban or the mixtures of barban and MCPA. In a similar test applied on the same date to flax (averaging 2.5 in. high), the stand of wild oats ($1\frac{1}{4}$- to $1\frac{1}{2}$-leaf stage) was insufficient for dependable evaluation. No injury to flax was observed at rates of 0.75 lb/A and less of barban. A mixture of 0.5 lb. barban and 0.5 lb MCPA/A gave 50 percent control of wild oats without apparent damage to flax. Similar results were obtained when the amount of MCPA in the mixture was reduced to 0.25 lb/A. (Contribution No. 319 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Sask. Agric. Res. Foundation.)

Control of wild buckwheat by herbicides, 1961. Skoglund, N.A. and R.T. Coupland. Duplicated plots (15 x 200 ft.) in a volunteer stand of wild buckwheat on silty clay loam soil at Saskatoon were treated with barban and the sodium salt of MCPA using initial rates of 2 lb/A and 8 lb/A, respectively, in a logarithmic sprayer in 32 Imperial gal. of water. The infestation of wild buckwheat averaged 6 plants per sq. yd. on untreated checks. Estimates of control on July 11 are summarized as follows:

	Barban, applied		MCPA
	June 3	June 10	June 10
Stage of wild buckwheat			
Cotyledons	Intact	Shed	Shed
First pair leaves	Present	Present	Present
Second pair leaves	-	Emerging	Emerging
Percent control at			
8 lb/A	-	-	100
4 lb/A	-	-	95
2 lb/A	100	88	77
1 lb/A	92	82	21
0.5 lb/A	52	50	-

(Contribution No. 320 from the Department of Plant Ecology, University of Saskatchewan, Saskatchewan, Sask., with financial assistance from the Sask. Agric. Res. Foundation.)

Control of wild oats by barban in rape, 1961. Skoglund, N.A. and R.T. Coupland. Barban was applied at an initial rate of 2 lb/A (using a logarithmic sprayer) to a seeded mixture of Arlo rape and wild oats on silty clay loams at Saskatoon on June 3 and June 10 in 32 Imperial gal. of water. The effect of the treatments was estimated (by sample counts of plants of wild oats and by visual estimates on rape) on treated plots and checks as follows:

	Treated	
	June 3	June 10
Wild oats		
Stage	2-leaf	2-3 leaf
Percent control from		
2.0 lb/A	100	100
1.0 lb/A	100	100
0.5 lb/A	95	95
0.3 lb/A	20	40
Rape		
Stage	1 in rosette	1 in rosette
Percent damage from		
2 lb/A	90	90
1.25 lb/A	0	0

(Contribution No. 321 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask. with financial assistance from the Sask. Agric. Res. Foundation.)

Control of wild oats by pre-emergence herbicides at Saskatoon, 1961. Skoglund, N.A. and R.T. Coupland. Single treatments (plots 15 x 200 ft.) of 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) and 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426) were sprayed at an initial rate of 4 lb/A with a logarithmic sprayer in 13.6 Imperial gal. of water on silty clay loam soil on May 18. The plots were seeded to Arlo rape and wild oats on the same day. Drought and insect damage resulted in a thin stand (10 percent of normal) of rape, but the wild oats averaged 7 plants/sq. yd. in checks. Sample counts indicated the following percentage control of wild oats:

Rate (lb/A)	Avadex	CP 23426
4	96	98
2	95	97
1	96	97

Control by CP 23426 was slightly superior to that by Avadex. Control was effective down to 13 oz/A of Avadex and 11 oz/A of the analogue. No effect was caused to rape. (Contribution No. 322 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Monsanto Chemical Company.)

Comparative control of tartary buckwheat by several herbicides, 1961. Skoglund, N.A. and R.T. Coupland. Tartary buckwheat (wheat had been seeded at Saskatoon on May 23 in rows 1.5 ft. apart) was treated with the following herbicides at three rates in 9.7 Imperial gal. of water on June 22-23, when the weed was in the 2- 4-leaf stage and 1 to 3 in. high: a pure acid form of 2,4-D (Weedone 638); the propylene gylcol butyl ether (PGBE) ester of 2,4-D; the butoxyethanol ester of 2,4-D; the butoxyethanol ester of 2,4-D (ACP-502, invert emulsion); the dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D); the dimethylamine salt of 2-methyl-3,5,6-trichlorobenzoic acid (Banvel T); the PGBE ester of silvex; a mixture of the amyl ester of 2,3,5-trichlorophenoxyacetic acid and the butyl ester of MCPA (Celatox); mixed amine salts of 2,4,5-T; DNBP acetate (Aretit); and O-3,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron); all at 4, 8, and 16 oz/A; the sodium salt of MCPA; a mixture of chlorinated benzoic and cresoxyacetic acids (CP 18-15); the mono-N,N-dimethylcocoamine salt of endothal; and trimethylsulfonium chloride (SD 6623); all at 8, 16, and 24 oz/A; the sodium salt of 4-(MCPB); a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA; the potassium salt of 2-(MCPP); and the butyl ester of 4-(2,4-DB); all at 16, 24 and 32 oz/A. Notes taken on July 23-24 indicated the following degrees of control (0- no control, 65 - satisfactory control, 100 - complete killing):

Herbicide	Rate, oz/A				
	4	8	16	24	32
2-(MCPP) (potassium salt)			80	100	100
endothal (mono-N,N-dimethylcocoamine salt)		29	100	100	
Banvel D	29	79	100		
*2,4-D (butoxy ethanol ester)	33	75	100		
4-(MCPB) (sodium salt)			21	71	100
4-(2,4-DB) (butyl ester)			29	79	92
Banvel T	12	29	92		
MCPA (sodium salt)		4	79	88	
2,4-D (PGBE ester)	25	54	79		
4-(MCPB) (sodium salt) and MCPA			8	21	71
CP 18-15		8	33	58	
Silvex (PGBE)	17	25	62		
Celatox	4	4	12		
Aretit	0	21	25		
2,4,5-T (amine salts)	8	12	17		
2,4-D (pure acid)	8	17	25		
Zytron	12	17	21		

*Applied in oil.

SD 6623 gave no control, even at the highest rate applied. (Contribution No. 323 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Sask. Agric. Res. Foundation.)

Comparative control of Russian thistle by several herbicides, 1961. Skoglund, N.A. and R.T. Coupland. Russian thistle (which had been seeded at Saskatoon on May 23 in rows 1.5 ft. apart) was treated with the herbicides used in Contribution 323, above, at three rates in 9.7 Imperial gal. of water on June 22-23, when the weed was 1 to 3 in. high: a pure acid form of 2,4-D (Weedone 638); the propylene glycol butyl ether (PGBE) ester of 2,4-D: the butoxyethanol

ester of 2,4-D (ACP-502), invert emulsion); the dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D): the dimethylamine salt of 2-methyl03,5,6-trichlorobenzoic acid (Banvel T): the PGBE ester of silvex; a mixture of the amyl ester of 2,3,5-trichlorophenoxyacetic acid and the butyl ester of MCPA (Celatox); mixed amine salts of 2,4,5-T; DNBP acetate (Aretit); and O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron); all at 4, 8, and 16 oz/A; the sodium salt of MCPA; a mixture of chlorinated benzoic and cresoxyacetic acids (CP 18-15); the mono-N,N-dimethylcocoamine salt of endothal; and trimethylsulfonium chloride (SD 6623); all at 8, 16,and 24 oz/A; the sodium salt of 4-(MCPB); a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA; the potassium salt of 2-(MCPP); and the butyl ester of 4-(2,4-DB); all at 16, 24 and 32 oz/A. Notes taken on July 23-24 indicated the following degree of control (0- no control, 65 - satisfactory control, 100 - complete killing):

Herbicide	Rate, oz/A				
	4	8	16	24	32
2,4-D (PGBE ester)	0	62	66		
4-(2,4-DB) (butyl ester)			12	79	92
Banvel D	0	75	92		
CP 18-15		0	8	62	
4-(MCPB) (sodium salt)			0	4	12
Aretit	0	4	4		
2,4,5-T (amine salts)	0	0	8		
Silvex (PGBE ester)	0	0	25		

The ten herbicides not listed in the table gave no control, even at the highest rate. (Contribution No. 324 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Sask. Agric. Res. Foundation.)

<u>Comparative control of nightflowering catchfly by several herbicides, 1961</u>. Skoglund, N.A. and R.T. Coupland. Nightflowering catchfly (which had been seeded at Saskatoon on May 23 in rows 1.5 ft. apart) was treated with the herbicides used in Contribution 323, above, at three rates in 9.7 Imperial gal. of water on June 22-23, when the weed had emerged for only 7 or 8 days and was still in the early rosette stage: a pure acid form of 2,4-D (Weedone 638); the propylene glycol butyl ether (PGBE) ester of 2,4-D; the butoxyethanol ester of 2,4-D (ACP-502, invert emulsion); the dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D); the dimethylamine salt of 2-methyl-3,5,6-trichlorobenzoic acid (Banvel T); the PGBE ester of silvex; a mixture of the amyl ester of 2,3,5-trichlorophenoxyacetic acid and the butyl ester of MCPA (Celatox); mixed amine salts of 2,4,5-T; DNBP acetate (Aretit); and O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron); all at 4, 8, and 16 oz/A; the sodium salt of MCPA; a mixture of chlorinated benzoic and cresoxyacetic acids (CP 18-15); the mono-N,N-dimethylcocoamine salt of endothal; and trimethylsulfonium chloride (SD 6623); all at 8, 16, and 24 oz/A; the sodium salt of 4-(MCPB); a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA; the potassium salt of 2-(MCPP); and the butyl ester of 4-(2,4-DB); all at 16, 24 and 32 oz/A. Notes taken on July 23-24 indicated that the following degree of control (0-no control, 65 - satisfactory control, 100 - complete killing): (Table on next page.) The four herbicides not listed in the table gave no control, even at the highest rate. (Contribution No. 325 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the

Sask. Agric. Res. Foundation.)

Herbicides	Rate, oz/A				
	4	8	16	24	32
Silvex (PGBE ester)	4	8	54		
2,4-D (butoxyethanol ester)*	12	25	37		
Banvel D	4	8	33		
Banvel T	0	0	21		
2-(MCPP) (potassium salt)			12	12	12
4-(2,4-DB) (butyl ester)			12	12	12
Aretit	4	8	12		
Zytron	0	4	8		
Endothal (mono-N,N-dimethylcocoamine salt)		0	4	8	
2,4-D (PGBE ester)	0	4	8		
4-(MCPB) (sodium salt)			0	4	8
CP 18-15		0	4	8	
SD 6623		0	0	12	
4-(MCPB) (sodium salt) and MCPA			0	4	8

*Applied in oil

Comparative control of rough pigweed (Amaranthus retroflexus) by several herbicides, 1961. Skoglund, N.A. and R.T. Coupland. Rough pigweed (which had been seeded at Saskatoon on May 23 in rows 1.5 ft. apart) was treated with herbicides used in Contribution 323, above, at three rates in 9.7 Imperial gal. of water on June 22-23, when the weed was in the 2- to 4-leaf stage and from 0.5 to 2 in. high: a pure acid form of 2,4-D (Weedone 638); the propylene glycol butyl ether (PGBE) ester of 2,4-D; the butoxyethanol ester of 2,4-D (ACP-502, invert emulsion); the dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D); the dimethylamine salt of 2-methyl-3,5,6-trichlorobenzoic acid (Banvel T); the PGBE ester of silvex; a mixture of the amyl ester of 2,3,5-trichlorophenoxyacetic acid and the butyl ester of MCPA (Celatox); mixed amine salts of 2,4,5-T; DNBP acetate (Aretit); and O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron); all at 4, 8, and 16 oz/A; the sodium salt of MCPA; a mixture of chlorinated benzoic and cresoxyacetic acids (CP 18-15); the mono-N,N-dimethylcocoamine salt of endothal; and trimethylsulfonium chloride (SD 6623); all at 8, 16, and 24 oz/A; the sodium salt of 4-(MCPB); a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA; the potassium salt of 2-(MCPP); and the butyl ester of 4-(2,4-DB); all at 16, 24 and 32 oz/A. Notes taken on July 23-24 indicated the following degree of control (0- no control, 65 - satisfactory control, 100 - complete killing): (Table on next page.) The five herbicides not listed in the table gave no control even at the highest rate. (Contribution No. 326 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Sask. Agric. Res. Foundation.)

Herbicides	Rate, oz/A 4	8	16	24	32
4-(2,4-DB) (butyl ester)			42	100	100
2,4-D (butoxy ethanol ester)*	12	100	100		
2,4-D (PGBE ester)	12	100	100		
2,4-D (pure acid)	0	62	100		
Banvel D	8	75	100		
4- (MCPB) (sodium salt)			4	17	46
CP 18-15		8	37	37	
MCPA (sodium salt)		0	17	25	
Silvex (PGBE ester)	0	4	21		
Banvel T	0	4	29		
2-(MCPP) (potassium salt)			0	4	8
2,4,5-T (amine salts)	0	4	8		
4-(MCPB) (sodium salt) and MCPA			0	4	8

*Applied in oil

Comparative control of green smartweed by several herbicides, 1961. Skogland, N.A. and R.T. Coupland. Green smartweed (which had been seeded at Saskatoon on May 23 in rows 1.5 ft. apart) was treated with the herbicides used in Contribution 323, above, at three rates in 9.7 Imperial gal. of water on June 22-23, when the weed was in the 2 to 4 permanent leaf stage and from 1 to 3 in. high: a pure acid form of 2,4-D (Weedone 638); the propylene glycol butyl ether (PGBE) ester of 2,4-D; the butoxyethanol ester of 2,4-D (ACP-502, invert emulsion); the dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D); the dimethylamine salt of 2-methyl-3,5,6-trichlorobenzoic acid (Banvel T); the PGBE ester of silver; a mixture of the amyl ester of 2,3,5-trichlorophenoxy-acetic acid and the butyl ester of MCPA (Celatox); mixed amine salts of 2,4,5-T; DNBP acetate (Aretit); and O-2,4-dichlorophenyl O-methyl isopropylphosphoramido-thioate (Zytron); all at 4, 8, and 16 oz/A; the sodium salt of MCPA; a mixture of chlorinated benzoic and cresoxyacetic acids (CP 18-15); the mono-N,N-dimethylcocoamine salt of endothal; and trimethylsulfonium chloride (SD 6623); all at 8, 16, and 24 oz/A; the sodium salt of 4-(MCPB); a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA; the potassium salt of 2-(MCPP); and the butyl ester of 4-(2,4-DB); all at 16, 24 and 32 oz/A. Notes taken on July 23-24 indicated the following degree of control (0 - no control, 65 - satisfactory control, 100 - complete killing): (table on next page.) The three herbicides not listed in the table gave no control even at the highest rate. (Contribution No. 327 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Sask. Agric. Res. Foundation).

Herbicides	Rate oz/A 4	8	16	24	32
Banvel D	12	17	100		
4-(2,4-DB) (butyl ester)			12	29	42
Banvel T	17	21	37		
2,4-D (pure acid)	4	12	33		
MCPA (sodium salt)		0	17	29	
4-(MCPB) (sodium salt)			8	21	25
2-(MCPP) (potassium salt)			8	21	25
2,4-D (PGBE ester)	0	12	12		
SD 6623		0	4	17	
Silver (PGBE ester)	0	4	12		
Endothal (mono-N,N-dimethylcocoamine salt)		0	12	17	
CP 18-15		0	8	21	
Zytron		4	4	8	
Aretit	0	4	8		
4-(MCPB) (sodium salt) and MCPA			0	4	8

<u>Comparative control of purslane by several herbicides, 1961</u>. Skoglund, N.A. and R.T. Coupland. Purslane (which had been seeded at Saskatoon on May 23 in rows 1.5 ft. apart) was treated with the herbicides used in Contribution 323, above, at three rates in 9.7 Imperial gal. of water on June 22-23, when the weed ranged from two leaved seedlings up to rosettes 3 in. across: a pure acid form of 2,4-D (Weedone 638); the propylene glycol butyl ether (PGBE) ester of 2,4-D; the butoxyethanol ester of 2,4-D (ACP-502, invert emulsion); the dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D); the dimethylamine salt of 2-methyl-3,5,6-trichlorobenzoic acid (Banvel T); the PGBE ester ofsilvex; a mixture of the amyl ester of 2,3,5-trichlorophenoxyacetic acid and the butyl ester of MCPA (Celatox); mixed amine salts of 2,4,5-T; DNBP acetate (Aretit); and <u>O</u>-2,4-dichlorophenyl <u>O</u>-methyl isopropylphosphoramidothioate (Zytron); all at 4, 8, and 16 oz/A; the sodium salt of MCPA; a mixture of chlorinated benzoic and cresoxyacetic acids (CP 18-15); the mono-<u>N</u>,<u>N</u>-dimethylcocoamine salt of endothal; and trimethylsulfonium chloride (SD 6623); all at 8, 16, and 24 oz/A; the sodium salt of 4-(MCPB); a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA; the potassium salt of 2-(MCPP); and the butyl ester of 4-(2,4-DB); all at 16, 24 and 32 oz/A. Notes taken on July 23-24 indicated the following degree of control (0 - no control, 65 - satisfactory control, 100 - complete killing):

Herbicide	Rate oz/A 4	8	16	24	32
4-(2,4-DB) (butyl ester)			12	92	96
CP 18-15		0	37	96	
2,4-D (butoxy ethanol ester*)	0	50	88		
4-(MCPB) (sodium salt)			0	62	88
Banvel D	0	66	66		
2-(MCPP) (potassium salt)			0	54	58
2,4-D (PGBE ester)	0	50	50		
2,4-D (pure acid)	0	0	29		
MCPA (sodium salt)		0	4	8	

*Applied in oil

The nine herbicides not listed in the table gave no control even at the highest rate. (Contribution No. 328 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Sask. Agric. Res. Foundation.)

Comparative control of cow cockle by several herbicides, 1961. Skoglund, N.A. and R.T. Coupland. Cow cockle (which had been seeded at Saskatoon on May 23 in rows 1.5 ft. apart) was treated with the herbicides used in Contribution 323, above, at three rates in 9.7 Imperial gal. of water on June 22-23, when the weed was in the multiple leaf stage from 1 to 3 in. high: a pure acid form of 2,4-D (Weedone 638); the propylene glycol butyl ether (PGBE) ester of 2,4-D; the butoxyethanol ester of 2,4-D (ACP-502, invert emulsion); the dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D); the dimethylamine salt of 2-methyl-3,5,6-trichlorobenzoic acid (Banvel T); the PGBE ester of silvex; a mixture of the amyl ester of 2,3,5-trichlorophenoxyacetic acid and the butyl ester of MCPA (Celatox); mixed amine salts of 2,4,5-T; DNBP acetate (Aretit); and O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron); all at 4, 8, and 16 oz/A; the sodium salt of MCPA; a mixture of chlorinated benzoic and cresoxyacetic acids (CP 18-15); the mono-N,N-dimethylcocoamine salt of endothal; and trimethylsulfonium chloride (SD 6623); all at 8, 16, and 24 oz/A; the sodium salt of 4-(MCPB); a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA; the potassium salt of 2-(MCPP); and the butyl ester of 4-(2,4-DB); all at 16, 24 and 32 oz/A. Notes taken on July 23-24 indicated the following degrees of control (0 - no control, 65 - satisfactory control, 100 - complete killing):

Herbicide	Rate oz/A				
	4	8	16	24	32
MCPA (sodium salt)		0	4	42	
Silvex (PGBE ester)	8	12	25		
Banvel D	0	12	21		
2,4-D (PGBE ester)	4	8	21		
2,4-D (Butoxyethanol ester)*	0	12	17		
4-(2,4-DB) (butyl ester)			8	12	17
Zytron	0	8	17		
Banvel T	0	4	17		
4-(MCPB) (sodium salt) and MCPA			0	12	12
2,4,5-T (amine salts)	0	8	12		
2-(MCPP) (potassium salt)			8	8	8
2,4-D (pure acid)	0	4	8		
SD 6623		4	4	8	
4-(MCPB) (sodium salt)			0	4	8
CP 18-15		0	4	8	
Endothal (mono-N,N-dimethylcocoamine salt)		0	4	8	

*Applied in oil

Celatox and Aretit gave no control even at the highest rate applied. (Contribution No. 329 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask., with financial assistance from the Sask. Agri. Res. Foundation.)

Comparative control of largeseed falseflax by several herbicides, 1961. Skoglund, N.A. and R.T. Coupland. Largeseed falseflax (which had been seeded at Saskatoon on May 23 in rows 1.5 ft. apart) was treated with the herbicides used in Contribution 323, above, at three rates in 9.7 Imperial gal. of water on

June 22-23, when the weed was in prostrate rosettes with leaves 2 to 3 in. long: a pure acid form of 2,4-D (Weedone 638); the propylene glycol butyl ether (PGBE) ester of 2,4-D; the butoxyethanol ester of 2,4-D (ACP-502, invert emulsion); the dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D); the dimethylamine salt of 2-methyl-3,5,6-trichlorobenzoic acid (Banvel T); the PGBE ester of silvex; a mixture of the amyl ester of 2,3,5-trichlorophenoxyacetic acid and the butyl ester of MCPA (Celatox); mixed amine salts of 2,4,5-T; DNBP acetate (Aretit); and O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron); all at 4, 8, and 16 oz/A; the sodium salt of MCPA; a mixture of chlorinated benzoic and cresoxyacetic acids (CP 18-15); the mono-N,N-dimethylcocoamine salt of endothal; and trimethylsulfonium chloride (SD 6623); all at 8, 16, and 24 oz/A; the sodium salt of 4-(MCPB); a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA; the potassium salt of 2-(MCPP); and the butyl ester of 4-(2,4-DB); all at 16, 24 and 32 oz/A. Notes taken on July 23-24 indicated the following degree of control (0 - no control, 65 - satisfactory control, 100 - complete killing:

	Rate oz/A				
Herbicide	4	8	16	24	32
2,4-D (PGBE ester)	5	24	27		
Banvel D	3	5	20		
4-(2,4-DB) butyl ester			3	7	8
2,4-D (pure acid)	3	4	5		
Aretit	3	4	4		

The thirteen herbicides not listed in the table gave no control, even at the highest rate. (Contribution No. 330 from the Department of Plant Ecology, University of Saskatchewan, Saskatoon, Sask. with financial assistance from the Sask. Agric. Res. Foundation.)

Comparison of the effectiveness of different formulations of barban (Carbyne) on wild oats growing in wheat. Vanden Born, Wm. H. Quadruplicate plots were seeded with Thatcher wheat at 2 bu/A and cross-seeded with wild oats at 2½ bu/A, all on May 18. On June 1, when most of the wheat had three leaves and the wild oats had two leaves, the plots were sprayed with 0, 4, and 8 oz/A (in 10 gpa) of standard Carbyne (1 lb/gal) and two more concentrated formulations of the same herbicide (No. 2 and 2A, each with 2 lb/gal). Spraying was done at 40 psi, with fan-type nozzles pointed forward at an angle of 45°. Wild oat control by equivalent rates of the two formulations was nearly equal. The number of surviving wild oat tillers on 4 and 8 oz/A plots averaged 33 and 12 percent of the number of check plots, and their weight was reduced to 27 and 8 percent of controls by these rates. Carbyne treatment resulted in wheat yield increased of 4 - 8 bu/A in the case of the standard and No. 2A formulations. The observed decrease in yield in the case of formulation No. 2 may be due to abnormally high yields in the check plots. (Division of Crop Ecology, Department of Plant Science, University of Alberta).

Comparison of the effects of 2,3-dichloroallyl diisopropyldithiolcarbamate (Avadex) treatment combined with different sequences of incorporation and delayed seeding of wheat on a natural infestation of wild oats. Vanden Born, Wm. H. The experimental area was seeded to wild oats in 1960, and the oats were allowed to shatter to provide a natural infestation. On May 20, quadruplicate strips were double-disced or not disced, then sprayed with 1, and 1½ lb/A Avadex in 10 gpa, and double-disced again. A check strip received one double-discing only.

Strips thus treated were seeded, using a Columbia hand seeder, with Thatcher wheat at 2 bu/A, o, 3, 6, 9, and 12 days after treatment, or were not seeded. There was no observable difference in emergence of wheat between sprayed and unsprayed plots for any of the seeding dates. Stage of development of wheat at any one time was, of course, closely related to the date of seeding, but showed no observable correlation with herbicide treatment. Wild oats were slow to germinate and emerge, resulting in a definite upward gradient in weight and number of wild oat tillers as seeding was delayed longer. Treatment resulted in an increased wheat yield at the later seeding dates (7 - 10 bu/A) but not when wheat was seeded immediately or three days after treatment. Chemical treatment, regardless of rate or prior discing, reduced weight and number of wild oat tillers by nearly 50 percent in all cases except when wheat was seeded immediately or three days following treatment when there was no increase in wheat yield, nor any marked reduction in wild oats. The latter observation is doubtless also related to the slow emergence of the wild oats in the experiment. (Division of Crop Ecology, Department of Plant Science, University of Alberta.)

<u>Effect of fertilization on the response of wild oats growing in wheat to treatment with barban (Carbyne)</u>. Vanden Born, Wm. H. Quadruplicate plots were seeded to Thatcher wheat at 2 bu/A and cross-seeded with wild oats at $2\frac{1}{2}$ bu/A, all on May 18. On half of the plots the wheat was mixed with the equivalent of 75 lb/A ammonium phosphate fertilizer (11-48-0) prior to seeding. Plots were sprayed on June 1 with 0, 4, and 8 oz/A Carbyne in 10 gpa. Spraying was done at 40 psi with fan type nozzles pointed forward at a 45^{o} angle. At spraying time the wheat had $2\frac{1}{2}$ - 3 leaves, and most wild oat plants had 2 leaves. The 4 oz/A rate of Carbyne was too low to produce satisfactory results; dry weight of wild oats was reduced to 96 and 52 percent, the number of tillers to 64 and 62 percent, on fertilized and unfertilized plots, respectively. Corresponding values for the 8 oz/A treatment with Carbyne are 10 and 20 percent for dry weight, and 14 and 25 percent for number of wild oat tillers, on fertilized and unfertilized plots, indicating a slightly improved response of wild oats to Carbyne treatment at 8 oz/A following fertilizer application. Wheat yield increased following treatment with Carbyne were nearly the same on both fertilized and unfertilized plots, and ranged from 10 to 14 bu/A. (Division of Crop Ecology, Department of Plant Science, University of Alberta.)

<u>Effect of barban (Carbyne) on wild oats growing in wheat and on wheat growing alone</u>. Vanden Born, Wm. H. Quadruplicate plots were seeded to Thatcher wheat at 2 bu/A on May 18, and half of each plot was cross-seeded with wild oats at $2\frac{1}{2}$ bu/A on the same date. Half of the plots were sprayed with Carbyne at 0, 4, 6, and 8 oz/A in 10 gpa on June 1 (stage 1) when most wheat plants had 3 leaves and most wild oats had 2 leaves. The remaining plots were given the same treatments on June 7 (stage 2), when the wheat plants had $3\frac{1}{2}$ - 4 leaves and the wild oats had 2 - 3 leaves. Spraying was done at 40 psi with fan-type nozzles pointed forward at an angle of 45^{o}. Wheat yields in weedfree plots were reduced slightly following treatment at stage 1, but not at stage 2. There was no visible injury to wheat from any of the treatments. Wheat yields on treated weedy plots were 4 - 10 bu/A higher than on weedy controls. Yield increases were slightly higher following treatment at stage 1 than at stage 2. Dry weight of wild oat plants was reduced to 41, 10, and 6 percent, and number of tillers to 69, 21, and 10 percent, by 4, 6, and 8 oz/A of Carbyne at stage 1. Corresponding values for the same treatments at stage 2 were 104, 55, and 59 percent for dry weight, and 70, 50, and 43 percent for number of tillers of wild oats. The date indicate that 4 oz/A is too low a rate, and emphasize the importance of the stage of growth of wild oats at the time of application. (Division of Crop Ecology, Department of Plant Science, University of Alberta.)

Comparison of the effect of Avadex on fertilized and unfertilized plots of wheat with and without wild oats. Vanden Born, Wm. H. Quadruplicate plots were sprayed on May 19 with 0, 1, and $1\frac{1}{2}$ lb/A 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) in 10 gpa, double-disked, and then seeded to Thatcher wheat at 2 bu/A with or without 75 lb/A ammonium phosphate fertilizer (11-48-0). One half of each plot was immediately cross-seeded with wild oats at $2\frac{1}{2}$ bu/A. At the rates used, Avadex did not provide satisfactory control of wild oats, though there was a marked reduction in their weight (to 56 and 61 percent of control) and in number of tillers (to 56 and 55 percent of control) on the 1 and $1\frac{1}{2}$ lb/A unfertilized plots. Control of wild oats was improved slightly by the application of fertilizer; weight and number of wild oat tillers were reduced to 36 - 42 percent of control at both rates of Avadex. Some thinning of the stand of wheat was observed, particularly at the $1\frac{1}{2}$ lb/A rate. Treated plots nevertheless, showed 4 - 7 bu/A yield increased over untreated plots on both fertilized and unfertilized plots, the former yielding 3 - 7 bu/A more than the latter. (Division of Crop Ecology, Department of Plant Science, University of Alberta.)

Response of Tartary buckwheat growing in wheat to treatment with 2,4-D, Banvel D, Banvel T, and barban (Carbyne). Vanden Born, Wm. H. On May 19 quadruplicate plots were seeded with Thatcher wheat and half of each plot was cross-seeded with Tartary buckwheat. On June 5, when the wheat had 3 - 4 leaves and was 6 inches tall, and the buckwheat had 3 true leaves, the plots were sprayed with 0, 4, 6, and 8 oz/A ethyl ester of 2,4-D; 0, 4, 6, and 8 oz/A iso-octyl ester of 2,4-D; 0, 2+6, 4+4, and 6+2 oz/A of mixed ethyl plus iso-octyl esters of 2,4-D; 0, 4, 8, and 16 oz/A Banvel D (2-methoxy-3,6-dichlorobenzoic acid); 0, 4, 8, and 16 oz/A Banvel T (2-methoxy-3,5,6-trichlorobenzoic acid); and 0, 4, 8, and 16 oz/A barban (Carbyne) all in 10 gpa water. Banvel D, particularly at the higher rates, caused some injury to the wheat, visible within one-week after spraying, and later manifested in some head deformities. Wheat yields in weedfree plots showing injury were slightly, though not consistently, reduced. Check plots averaged 94 buckwheat plants per square yard. The data suggest that the iso-octyl (low volatile) ester of 2,4-D was preferable to the ethyl ester, though it may be pointed out that 6 oz/A of ethyl ester was as effective as 4 oz/A of iso-octyl ester in controlling buckwheat, at approximately equal cost. There appeared to be no real advantage in using mixtures of the two esters over using the low-volatile ester alone. Highest wheat yields in weedy plots (60 percent increase) were obtained following spraying with Banvel T at 16 oz/A, though most effective control of buckwheat (100 percent kill) resulted from applying the same rate of Banvel D. (Division of Crop Ecology, Department of Plant Science, University of Alberta.)

Comparison of Avadex and CP 23426 on wild oats growing in wheat. Vanden Born, Wm. H. On May 19 quadruplicate plots were sprayed with standard Avadex (2,3-dichloroallyl diisopropylthiolcarbamate), a 6 lb/gal formulation of Avadex, and CP 23426 (2,3,3-trichloroallyl diisopropylthiolcarbamate) at 0, 1, and 2 lb/A in 10 gpa. Plots were double-disced immediately after spraying, seeded with Thatcher wheat at 2 bu/A, and cross-seeded with wild oats at $2\frac{1}{2}$ bu/A. Some thinning of the wheat occurred, particularly at the 2 lb/A rate of all three herbicides. All treatments except one (Avadex (4 lb/gal) at 1 lb/A) resulted in a marked increase in yield of wheat (5 - 11 bu/A). Avadex (4 lb/gal), Avadex (6 lb/gal) and CP 23426 at 1 lb/A reduced the dry weight of wild oat plants to 83, 81 and 23 percent, and the number of tillers to 80, 59 and 20 percent of controls. The same herbicides at 2 lb/A reduced the weight of wild oat tillers to 38, 29 and 10%, and their numbers to 33, 26 and 6%. Particularly at 1 lb/A,

but also at 2 lb/A, CP 23426 controlled wild oats more effectively than did either formulation of Avadex. The 6 lb/gal formulation appeared to be slightly more effective than the 4 lb/gal one. (Division of Crop Ecology, Department of Plant Science, University of Alberta.)

CORN, SORGHUM, AND SOYBEANS

Directed dalapon sprays for annual grass control in corn. R. Behrens. Two-row by 30 ft. plots of corn hybrid, Minhybrid 507, replicated 4 times, were treated with directed applications of dalapon at rates of 1.10 and 1.48 lb/A plus an amine salt of 2,4-D at 0.50 lb/A using 2 nozzles per row. The spray was directed to either the lower 1/3 or 1/2 of the corn plants when the corn was 6, 12 or 18 inches tall. Weeds between the rows were controlled by 2 cultivations. Dalapon injury to the corn was not apparent as malformations or yield reductions. The dry weight of weeds, mostly Setaria spp., was reduced from 3300 to 880 lb/A by the most effective treatment; spraying the lower 1/3 of corn 6 inches tall with 1.48 lb/A of dalapon. Spraying when corn was 12 inches tall gave slightly better weed control than when corn was 6 inches tall and much better weed control than when corn was 18 inches tall. Increasing the dalapon rate from 1.10 to 1.48 lb/A reduced weed weights about 500 lb/A. Spraying the lower 1/3 of the corn plants reduced weed weights about 700 lb/A more than spraying the lower 1/2 of the corn plants. (Dept. of Agronomy and Plant Genetics, Univ. of Minnesota, St. Paul. Paper No. 4746 Sci. Jour. Series, Minn. Agr. Expt. Sta.)

Response of corn inbreds to atrazine. R. Behrens and L.G. Isenberg. A group of corn inbreds (V3, CMD5rr, B8, B14, M14, B21, W33rr, W59M, W64Arr, W103rr, W153R, ND203rr, A239, A295rr, A297, A417rr, A495rr, A498, A508rr, A509, A554, A556rr, A619, MS1334, WDrr, WH) were evaluated for tolerance to pre- and post-emergence applications of atrazine at 3 and 9 lb/A. There were no stand reductions or great differences in plant growth and development due to the atrazine treatments. All of the inbreds included in this test were rated tolerant of atrazine. (Dept. of Agronomy and Plant Genetics, Univ. of Minnesota, St. Paul. Paper No. 4745 Sci. Jour. Series, Minn. Agr. Expt. Sta.)

Abstract for the 1961 North Central
Weed Control Conference Research Report

Effect of equidistant planting and herbicide treatments on corn and weed yields. Colville, W.L., and Burnside, O.C. Nebraska 703R corn was planted May 23, 1961, in Wabash silty clay loam at Lincoln, Nebraska. Preemergence applications of atrazine at 3 lb/A were applied May 23, and postemergence applications of 2,4-D amine at 1/2 lb/A were applied June 16. The plots received no cultivations but were irrigated at the layby and silking stages of the corn. Major weed species present were Amaranthus spp., Panicum dichototomiflorum Michx., Setaria spp., and Polygonum spp. Weed yields were taken September 7-11 by clipping 16 square feet in each plot. Corn yields were taken October 2-6. (Table on next page.) The 2,4-D was applied to plots not receiving hand-hoeing or atrazine to prevent Amaranthus spp. from destroying the corn yields. The high weed yields in the atrazine treated plots are due to a single species, Panicum dichototomiflorum. Weed yields increased with increasing corn row and hill widths and decreasing number of corn plants per hill. Corn yields were generally inversely proportional to weed yields. Decreasing corn row and hill spacings from 40 inches resulted in increased corn yields. A plant population of 16-20,000 plants per acre generally resulted in the highest corn yields. (Contribution of the Department of Agronomy, University of Nebraska, Lincoln, Nebraska. Published with the approval of the Director as paper No. 1173a, Journal Series, Nebraska Agr. Exp. Sta.)

Treatment	Row and hill spacing inches	Plants per hill	Oven-dry weed yield lb/A	Corn yields bu/A 15.5% moisture
Hand-weeded until layby stage of corn	20	1	60	163
		2	10	163
		3	0	129
	30	2	40	144
		3	60	156
		4	40	154
	40	3	480	121
		4	190	125
		5	80	130
2,4-D amine 1/2 lb/A	20	1	4640	88
		2	2280	102
		3	1790	78
	30	2	3680	95
		3	2970	104
		4	2520	106
	40	3	7100	35
		4	5900	45
		5	4820	49
Atrazine 3 lb/A	20	1	1160	146
		2	740	133
		3	200	109
	30	2	3680	95
		3	2970	104
		4	2520	106
	40	3	3370	72
		4	4300	65
		5	4050	75

Abstract for the 1961 North Central
Weed Control Conference Research Report

<u>Effect of row widths and atrazine treatments on sorghum and weed yields</u>. Burnside, O.C. RS 501 sorghum was planted in 10, 20, 30, and 40 inch row widths on May 29, 1961, in Wymore silty clay loam at Lincoln, Nebraska. Preemergence atrazine treatments were applied June 20 to quadruplicated plots. Within four days after the preemergence applications 0.47 inches of rain fell. When the sorghum was about one inch tall all row widths were thinned to a population of 26,136 plants per acre. The plots received no cultivations. Major weed species present were *Setaria* spp., *Digitaria sanguinalis* (L.) Scop., *Amaranthus* spp., and *Abutilon theophrasti* Medic. Weed yields were obtained October 16-21 by clipping 16 square feet in each plot. Sorghum yields were obtained September 9-15. (Table on next page.)

Treatment	Row spacing inches	Oven-dry weed yield lb/A	Sorghum yields bu/A 14% moisture	Sorghum treatment average
None (check)	10	1790	15	15
	20	1730	17	
	30	2070	14	
	40	1890	16	
Hand-weeded	10	10	60	68
	20	0	70	
	30	5	73	
	40	5	69	
Atrazine 1 lb/A preemergence	10	240	76	72
	20	280	74	
	30	260	73	
	40	550	67	
Atrazine 2 lb/A preemergence	10	110	76	78
	20	130	82	
	30	140	73	
	40	200	82	
Atrazine 4 lb/A preemergence	10	40	79	82
	20	20	87	
	30	20	79	
	40	100	83	
Atrazine 2 lb/A postemergence	10	1600	28	35
	20	1620	43	
	30	1780	30	
	40	1150	38	

Weed yields in preemergence atrazine treated plots decreased with decreasing row spacings. Postemergence atrazine applications on weeds 1 to 2 inches tall were effective only on the broadleaf species. Grassy weeds were then more of a problem in the postemergence atrazine plots than they were in the check plots. Sorghum yields in plots given preemergence atrazine treatments were as large or larger than those in hand-weeded plots. Sorghum yields were not greatly affected by row spacings in this experiment where plant populations were kept constant. Grassy weeds in postemergence atrazine treated plots severely reduced sorghum yields. (Contribution of the Department of Agronomy, University of Nebraska, Lincoln, Nebraska. Published with the approval of the Director as paper No. 1174a, Journal Series, Nebraska Agr. Exp. Sta.)

Abstract for the 1961 North Central
Weed Control Conference Research Report

Effect of cultivations and herbicide treatments on sorghum and weed yields. Burnside, O.C. RS 610 sorghum was planted in 40 inch rows on May 29, 1961, in Wymore silty clay loam at Lincoln, Nebraska. Preemergence herbicide treatments were applied June 2. Within four days after the preemergence

applications 0.47 inches of rain fell. When the sorghum was 1-2 inches tall it was thinned to one plant every six inches of row. Each herbicide plot was split into four 4-row plots which received 0, 1, 2 and 3 cultivations. Cultivation dates were June 21, June 30, and July 18. Major weed species present were Setaria spp., Amaranthus spp., Digitaria sanguinalis (L.) Scop. and Abutilon theophrasti Medic. Weed yields were obtained October 21-25 by clipping 80 square feet in each plot. Sorghum yields were obtained by harvesting two 25 foot rows September 26-29. Sorghum and weed yields were averaged over the following preemergence herbicide applications: atrazine at 1, 2, and 4 lb/A; CDAA-T (CDAA + trichlorobenzyl chloride) (Randox-T) at 5, 10, and 15 lb/A; and propazine at 2 and 4 lb/A.

Treatment	No. of cultivations	Oven-dry weed yield lb/A	Sorghum yields bu/A at 14% moisture
None (check)	0	920	45
	1	300	63
	2	120	86
	3	90	94
Hand-weeded	0	40	89
	1	10	94
	2	10	99
	3	0	91
Average of eight preemergence herbicide treatments	0	80	90
	1	10	90
	2	10	96
	3	10	92

Weed yields were reduced by cultivations. Herbicides at the application rates used were generally effective in controlling weeds. Plots receiving no herbicides or hand-hoeing required three cultivations to attain a sorghum yield as great as those on hand-weeded plots. Where herbicides were used for weed control sorghum yields were generally comparable to yields on hand-weeded plots. Maximum sorghum yields in hand-weeded and herbicide treated plots were obtained when plots received two cultivations and then declined when plots were given the third cultivation. (Contribution of the Department of Agronomy, University of Nebraska, Lincoln, Nebraska. Published with the approval of the Director as paper No. 1175a, Journal Series, Nebraska Agr. Exp. Sta.)

Abstract for the 1961 North Central
Weed Control Conference Research Report

Effect of row widths and amiben treatments on soybean and weed yields. Burnside, O.C., and Colville, W.L. Ford soybeans were planted May 24, 1961, in Wymore silty clay loam at Lincoln, Nebraska. Soybean planting rate was 90 lb/A in 10, 20, 30, and 40 inch rows, but resulting plant populations were 145,000, 135,000, 110,000 and 90,000 per acre, respectively. Preemergence applications of amiben were applied May 26 to quadruplicated plots. The plots received no cultivations. Major weed species present were Amaranthus spp., Setaria spp., Digitaria sanguinalis (L.) Scop. and Abutilon theophrasti Medic. Weed yields were taken October 14 by clipping 16 square feet in each plot. Soybean yields

were taken October 19-23. (See table below.) Increasing amiben applications from 1 to 4 lb/A decreased weed yields in all row spacings, but the largest reductions in weed yields occurred in the narrower soybean row spacings. Soybean yields in 10, 20, and 30 inch row spacings were greater in all treatments than in 40 inch rows. The 10 inch row width resulted in the highest soybean yield in all treatments except the uncultivated check plots where the 20 inch row width gave the highest yield. These results point out the yield advantage of row spacings less than 40 inches. Also, less amiben is required in the narrower rows for satisfactory weed control. This was shown when amiben at 1 lb/A in 10 inch rows reduced weed yields from 370 to 320 lb/A; whereas, amiben at 4 lb/A in 40 inch rows reduced weed yields to from 760 to 390 lb/A. (Contribution of the Department of Agronomy, University of Nebraska, Lincoln, Nebraska. Published with the approval of the Director as paper No. 1171a, Journal Series, Nebraska Agr. Exp. Sta.)

Treatment	Row width inches	Oven-dry weed yields lb/A	Soybean yields bu/A
None (check)	10	950	16.8
	20	1100	19.4
	30	1060	15.8
	40	1370	12.0
Hand-weeded	10	10	31.3
	20	5	29.1
	30	10	30.5
	40	0	26.1
Amiben 1 lb/A	10	320	29.2
	20	520	24.4
	30	600	22.4
	40	1140	17.5
Amiben 2 lb/A	10	200	30.5
	20	280	26.4
	30	440	24.9
	40	790	19.0
Amiben 4 lb/A	10	120	27.5
	20	140	28.4
	30	120	28.0
	40	730	23.7

<u>Control of weeds in corn with preemergence herbicides</u>. Freeman. J.F. Corn, Ky. 105 hybrid, was planted 3 inches deep in Captina silt loam soil at Lexington May 31, 1961. Two-row plots, 25 ft. long with an untreated check row between plots were used with treatments quadruplicated in randomized block design. Herbicides were applied June 1 and 2 in 13 inch bands centered over 40 inch drill rows, those sprayed being used in water at rate of 39 gpa solid coverage basis and granular (G) materials being applied with a commercial-type applicator adapted to use on bicycle-wheel sprayer chassis. Actual rate of spray and herbicide used was 1/3 that of the indicated solid-coverage rates. Soil-

incorporated treatments had the herbicides chopped into the soil with a garden rake 1" deep immediately after application. Rains amounting to 5 inches fell during 2-wk period after treatment, 1.7" of it immediately. Rough pigweed, crabgrass, foxtails and goosegrass were principal weeds. Control of broadleaf and grass weeds rated on 0-10 scale, no. weeds present on checks, crop stand and injury were determined June 30. Average no. weeds/sq. ft. for untreated checks was broadleaf, 31 and grasses, 24. The control rating for broadleaf and grass weeds is shown with each treatment (rates lb/A). Fenac, sodium salt 1.5 incorp., 10 and 9.5; EPTC 3 incorp., 10 and 10; EPTC (G) 3 incorp., 10 and 10; propyl ethyl-n-butylthiolcarbamate (Tillam) 3 incorp., 9 and 9; 6 incorp., 10 and 10; Tillam (G) 6 incorp., 10 and 10; tert-butyl di-n-propylthiolcarbamate (R-1856) 3 incorp., 2 and 5; 6 incorp., 4 and 8; R-1856 (G) 3 incorp., 2 and 7; CDAA plus trichlorobenzylchloride (CDAA-T) 3.1 + 7.9, 6 and 4; CDAA-T (G) 3.1 + 7.9, 9 and 7; 2,4-bis(3-methoxypropylamino)-6-methylthio-s-triazine (CP 17029) 2, 9 and 8; 3, 10 and 9; atrazine 2, 10 and 10; 3, 10 and 10; atrazine (G) 2, 10 and 10; simazine 2, 10 and 10; 3, 10 and 10; 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (duPont 326) 1.5, 10 and 10; 3, 10 and 10; 2,4-DEP 4, 9 and 6; PGBE ester of 2,4-D 2 (applied 2 days before corn emerged) 7 and 7; ethylhexanol ester of 2,4-D (G) 2, 9 and 6; 2,4-D acid (G) 2, 5 and 3; dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D) 1, 3 and 2; 2, 5 and 3; and cultivated check, 10 and 10. Reduction in stand of corn and/or injured plants based on no. plants in adjacent untreated rows was: Fenac 1.5 incorp., 13%; EPTC 3 incorp., 42%; EPTC (G) incorp., 41%; Tillam 6 incorp., 27%; R-1856, 6 incorp., 15%; Banvel D 2, 13%; and for all others 0-10%. (Department of Agronomy, Kentucky Agricultural Experiment Station).

Postemergence herbicide treatments in corn. Freeman, J.F. Corn, (Ky 105) was planted 3" deep in Captina silt loam soil at Lexington May 31, 1961. Two-row plots, 25' in length with untreated check rows between plots were used with treatments quadruplicated in randomized block design. Heavy stand of weeds emerged about with the corn during the 3 weeks of heavy rainfall following planting. Spray herbicides were applied broadcast in water 26 gpa June 21 when corn was at 4- to 5-leaf stage and weeds 1 to 1 1/2" tall excepting 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (duPont 326) which was applied as directed spray, 13 gpa June 30 when corn was 6" to 10" tall and weeds were 1.5 to 3" tall. Visual ratings of weed control (scale 0-10) were made July 29. Principal weeds were rough pigweed, crabgrass, foxtails and goosegrass. Treatments (rates in lb/A) are listed with weed control ratings of broadleaf and grass weeds. Atrazine 2, 10 and 0; 3, 10 and 2; simazine 2, 0 and 0; 2,4-bis(3-methoxypropylamino)-6-methylthio-s-triazine (CP 17029) 2, 10 and 1; 3, 10 and 2; duPont 326 1, 7 and 2; 1.5, 9 and 4; 3, 10 and 6; dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel-D) 1, 7 and 0; 2, 10 and 0, alkanolamine salts of 2,4-D 0.5, 10 and 0; and cultivated check, 10 and 10. Corn leaves were burned and plants stunted by CP 17029; but they later recovered. Leaves contacted by the directed duPont 326 sprays were burned also but plants were not injured. Crop injury by other herbicides was slight or none. (Agronomy Department, Kentucky Agricultural Experiment Station.)

Preemergence weed control in soybeans. Freeman, J.F. Soybeans (Clark variety) were planted 1 to 2" deep in moist Burgin silt loam soil at Lexington June 19, 1961. Two-row plots 25' in length with an untreated check row between plots were used with treatments quadruplicated in a randomized block design. Spray treatments were applied June 19 and granular treatments June 21, both in 13 inch-bands centered over rows 40" apart. Spray-herbicides were applied in water 39 gpa overall basis and granular (G) herbicides were applied with a

commercial type applicator mounted on bicycle-wheel sprayer chassis after field calibration. Actual rate of herbicides used in the band was 1/3 that of the over-all rate indicated. No rains fell from time of treatment until July 6 and weeds started slowly. Weed control of broadleaf and grass weeds and crop injury were rated visually July 28. Rough pigweed, speedwell spp., crabgrass, and foxtail were the principal weeds. The average number of weeds/sq. ft. in row bands of untreated checks was broadleaf 6 and grass 4. Treatments are listed (rates in lb/A) with the mean visual rating (0-10 scale) for control of broadleaf weeds and grass weeds. NPA 4, 7 and 7; 5, 7 and 7; NPA (G) 4, 7 and 6; CDAA 4, 5 and 5; CDAA (G) 4, 7 and 8; amiben 3, 9 and 8; amiben (G) 4, 8 and 8; sodium salt of PCP (dry formul.) 15, 7 and 5; (liquid formul.) 15, 8 and 7; (G) 15, 8 and 6; DNBP (G) 5, 7 and 6; EPTC 3, 8 and 4; EPTC (G) 3, 7 and 7; ethyl di-n-butylthiolcarbamate (R-1870) 3, 6 and 5; 6, 6 and 6; R-1870 (G) 6, 7 and 6; 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (duPont 326) 1.5, 9 and 8; 3, 10 and 9; 2, 4-bis(3-methoxypropylamino)-6-methylthio-s-triazine (CP 17029) 2, 9 and 8; 3, 9 and 8; and cultivated check 10 and 10. Crop injury ratings of about 1 were noted for NPA (G) 4, CDAA (G) 4, and CP-17029 3. Other treatments resulted in little or no injury. (Agronomy Department, Kentucky Agr. Exp. Sta.)

Pre-emergence weed control in soybeans. Peters, E.J. 1/ Clark soybeans were planted on Mexico silt loam on May 30, 1961. Pre-emergence herbicides in 40 gallons of water per acre were applied on May 31 to two-row plots. Materials and rates (lb/A) were as follows: 3 and $4\frac{1}{2}$ methyl N-(3,4-dichlorophenyl)carbamate (Niagara 2995); 6 and 8 N,N-dimethyl-2,2-diphenylacetamide (Diphenamid); 1, 2, and 3 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (DuPont 326); 4, 8 and 12 dimethyl 2,3,5,6-tetrachloroterephthalate (Dacthal); 2 and 4 2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine (Atrametryne); 2 and 4 2-chloro-4-ethylamino-6-(3-methoxypropylamino)-s-triazine (G-34696); 3 amiben; 20 sodium salt of PCP; and a mixture of 10 O-(2,4-dichlorophenyl) O-methyl isopropylphosphoramidothioate (Zytron) and 3 DNBP. Weeds present were barnyardgrass (Beauv.), fall panicum, common ragweed, Carolina horsenettle. Niagara 2995 at 3 lb/A controlled none of the weed species. The $4\frac{1}{2}$-lb. rate eliminated nearly all the ragweed. Dacthal and Diphenamid controlled the grass population, but no the broadleaved weeds. DuPont 326 controlled weeds but reduced the soybean stand at all rates. Atrametryne and G-34696 controlled all weeds except Carolina horsenettle, but the soybean stands were severely reduced. Dacthal and the mixture of Zytron and DNBP caused a constriction of the soybean stems at ground level with a corky layer above and below the constriction. Many of these plants were broken off by wind during the summer. Amiben gave almost complete weed control throughout the growing season. Weed control with PCP lasted for 4 to 6 weeks. No injury to soybeans was apparent with PCP or amiben. None of the herbicides controlled Carolina horsenettle. (Cooperative contribution of the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, and Missouri Agricultural Experiment Station.

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Mixtures of CDAA and atrazine or propazine for weed control in grain sorghum. Robinson, R.G., Thompson, J.R., Nelson, W.W., and Thompson, R.L. The relative effectiveness of CDAA alone or atrazine or propazine alone differs among trials. Atrazine or propazine may be relatively more effective than CDAA under cold conditions when weed emergence is delayed and uneven, whereas CDAA may be more effective than atrazine-propazine under very dry conditions. Mix-

tures of CDAA + atrazine or propazine might be expected to reduce the number of failures in preemergence weed control caused by conditions too dry or too cold for one of the herbicides. Moreover, it may be possible to use lower rates per acre of atrazine or propazine, and thus reduce the amount of harmful herbicide residue left in the soil. Trials in 1959-60 at Rosemount, Minnesota and in 1961 at Waseca, Lamberton, and Morris indicate that CDAA + triazine mixtures are promising preemergence treatments. These trials also indicate that atrazine or propazine can be used postemergence following a preemergence treatment. Yields from the 1961 plots have not yet been determined. Square rd. plots replicated three times in both 40 in. cultivated rows and 6-in. or 12-in. non-cultivated rows were used at each location. Average weed control scores (0 weed-free, 10 complete weed cover) in September at the three 1961 locations follow:

	Cultivated		Non-cultivated	
Herbicide and rate, lb/A	Grass	Non-grass	Grass	Non-grass
Untreated	6	4	8	4
CDAA, 4 preemergence	2	3	-	-
Propazine, 2 preemergence	5	1	6	0
Atrazine, 2 preemergence	4	1	-	-
CDAA, 2 + propazine, 2 preemergence	2	1	3	0
CDAA, 2 + atrazine, 2 preemergence	2	0	3	0
CDAA, 4 pre- + propazine, 2 postemergence	2	1	2	0
CDAA, 4 pre- + atrazine, 2 post-emergence	1	0	1	0
CDAA-T, (3.5 CDAA) preemergence	4	2	3	2

CDAA in these 1961 trials was more effective than atrazine or propazine, but the mixtures were better than CDAA or CDAA-T (CDAA, 3.1 lb + trichlorobenzyl chloride 6.3 lb/gal). (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul; Southern Station, Waseca; Southwest Station, Lamberton; and West Central Station, Morris. Paper No. 4743, Sci. Jour. Series, Minn. Agric. Expt. Sta.)

<u>Preemergence incorporated herbicide treatments for weed control in corn</u>. Sexsmith, J.J. Carmelcross sweet corn was seeded on May 2, 1961, on an irrigated loam soil at Barnwell, Alberta. On May 4 the following herbicide treatments were applied in triplicate to 10-in. bands over the rows of 50-ft. by 4 row plots and incorporated with Howry-Berg tiller units set to run at 1- to 1½-in. depths: atrazine at 1½ and 2 lb/A; EPTC at 3 and 4 lb/A; and a mixture of 3.36 lb. CDAA and 8.4 lb. trichlorobenzylchloride per Imperial gal. (Randox T) at 3 and 4 Imperial qt/A. The surface inch of soil was dry on May 4, but upwards of 1/2 inch of rain occurred on May 5 and 6, with further good showers during the subsequent 4 days. Weed counts were made on June 7, the total infestation of mixed weeds being 88/sq. yd., of which 30 were green foxtail and the remainder mixed broadleaf annuals. (Table on next page.) The only visible injury to corn was caused by the 4-lb. rate of EPTC, where a small percentage of the plants were showing a twisted and contorted growth. (Contributed by Canada Agriculture, Research Station, Lethbridge, Alberta.)

		Rate/A	Per cent control Broadleaf	Green foxtail	All annuals
1.	Atrazine	$1\frac{1}{2}$ lb	98	76	91
2.	"	2 lb	100	80	93
3.	EPTC	3 lb	90	100	93
4.	"	4 lb	94	100	96
5.	Randox T	3 qt	100	80	93
6.	"	4 qt	100	100	100

<u>Pre-emergence weed control in corn</u>. Stroube, E.W., Ascheman, R.E. and Hastings, R.E. Corn (hybrid A.E.S. 805) was planted in Brookston and Crosby silty clay loam at the Western Substation on May 19, 1961. The liquid and wettable powder formulations were applied in water at 40 gpa (overall rate). The plots were uniformly infested with redroot pigweed and annual grasses. There were scattered infestations of smartweed and velvetleaf. The ratings were made on June 26 and were the average of three replications. The triazine treatments were applied on May 20 before a 0.6 inch rain on May 20 and 21. The remaining treatments were applied on May 23. Growing conditions were near optimum for several weeks following planting. The wettable powder forms of atrazine at 1, 2 and 3 lb/A, simazine at 2 and 3 lb/A, and the granules of atrazine and simazine at 2 lb/A resulted in from 97 to 100% reduction of weeds. Simazine at 1 lb/A gave 93% weed control. 2,4-DEP at 4 and 6 lb/A reduced the weeds 83 and 90%. HN-1688 (methyldichlorobenzoic acid) at 2 and 4 lb/A resulted in 90 and 95% weed control. PGBE ester of 2,4-D (emulsion) at 2 lb/A reduced the weeds 80% while the granules reduced the broadleaf weeds 62% and the grasses 86%. CDAA plus trichlorobenzyl chloride at $3\frac{1}{2}$ plus 7 lb/A resulted in 50% weed control. The dimethylamine salt of 2,3,6-TBA at 2 lb/A controlled 90% of the weeds. DuPont 326 (3-(3,4-dichloropheryl)-1-methoxy-lmethylurea) at $1\frac{1}{2}$ and 3 lb/A controlled 88% of the broadleaf weeds and 95% of the grasses. Atrametryne (2-ethylamino-4-isopropylamino-6-methymercapto-<u>s</u>-triazine) at 1, 2 and 3 lb/A reduced the weeds approximately 45, 85 and 90%. Banvel D (2-methoxy-3,6-dichlorobenzoic acid) at $\frac{1}{2}$ and 2 lb/A controlled 66 and 88% of the weeds. Banvel T (2-methoxy-3,5,6-trichlorobenzoic acid) at 1 and 4 lb/A resulted in 57 and 93% weed control. Slight injury to corn was observed in plots treated with HN-1688 at 4 lb/A, DuPont 326 at 3 lb/A and Banvel D at 2 lb/A. No injury symptoms were observed on the other treatments. (The Ohio Agricultural Experiment Station.)

<u>Pre-emergence weed control in soybeans</u>. Stroube, E.W., Ascheman, R.E., and Hastings, R.E. Soybeans were planted on June 7, 1961, in Miami and Crosby silty clay loam at Columbus. The liquid and wettable powder formulations were applied in water at 40 gpa (over-all rate) on June 9. The plots had a uniform infestation of redroot pigweed and annual grasses. There were scattered infestations of velvetleaf, lambsquarters and jimson weed. The ratings were made on July 20 and are the average of three replications. The seeded plots received 1.1 inches of rainfall one day after planting and the herbicides were applied the following day. There was 0.75 inches of rainfall the two weeks following the treatments. Amiben at 2, 3, and 6 lb/A in liquid and granular form resulted in near perfect weed control (95% or above). Amiben plus CIPC at 2 lb/A of each gave from 94 to 98% weed control. CDAA at 4 lb/A controlled 75% of the weeds while CDAA plus the sodium salt of PCP at 3 plus 5 lb/A controlled 90% of the weeds. CIPC at 7 lb/A in liquid form gave 60% control and as granules, 80%.

NPA at 4 lb/A resulted in 68% control. NPA plus CIPC at 3 plus 2 lb/A resulted in approximately 80% control of weeds. Ipatone (2-methoxy-4-ethylamino-6-isopropylamino-s-triazine), atratone, Prometryne (2,4-bis(isopropylamino)-6-methylmercapto-s-triazine) and Atrametryne (2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine) at 2 and 4 lb/A resulted in excellent weed control (86 to 99%). Diphenamid (N,N-dimethyl-2,2-diphenylacetamide) at 4 lb/A controlled 82% of the weeds. Sodium PCP applied as liquid at 15 and 20 lb/A gave from 87 to 94% weed control. Sodium PCP granules at 20 lb/A controlled 75% of the weeds. DuPont 326 (3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea) at 1½ lb/A controlled 97% of the weeds. Slight injury to the soybeans was observed in plots treated with atratone at 2 lb/A and Ipatone and Prometryne at 4 lb/A. Atrametryne at 4 lb/A resulted in moderate injury. The soybeans treated with DuPont 326 at 1½ lb/A in one replication were moderately injured with no injury in the other two reps. No injury symptoms were observed on the other treatments. (The Ohio Agriculture Experiment Station.)

Chemical weed control in grain sorghum. Talbert, Ronald E. and Fletchall, O. Hale. RS 610 sorghum was planted in 40 inch rows on Mexico silt loam on June 1, 1961. Preemergence treatments were made June 3 and early postemergence treatments were made June 29 when the height of grain sorghum was 11 inches, common ragweed, the dominant broadleaved weed, was 1 to 3 inches, and fall panicum, the dominant weed grass, was 1 to 4 inches. Rainfall of 0.28 inches was recorded on June 2, 4.31 inches was recorded in the 2 weeks period following preemergence application, and 3 inches were recorded in the 2-day period following the early postemergence treatments. Treatments were applied to two row plots 30 feet long and were replicated 4 times. None of the plots were cultivated. Good control of both broadleaved weeds and grasses as indicated by counts made July 14, resulted from preemergence treatments of neburon at 2 lb/A, sodium salt of PCP at 20 lb/A, CDAA at 3 plus trichlorobenzyl chloride at 7.5 lb/A, amiben at 2 and 4 lb/A, propazine at 2 and 4 lb/A, Geigy 30026 (2-chloro-4-isopropylamino-6-methylamino-s-triazine) at 2 lb/A, Casoron (2,6-dichlorobenzonitrile) at 2 lb/A, DuPont 326 (3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea) at 1.5 and 3 lb/A and Olin Mathison 1306 (6-nitro-2,4-dichlorophenol) at 10 lb/A; and from early postemergence treatments od DNBP at 3 lb/A and di-N,N-dimethylcocoamine salt of endothal at 4 lb/A. Preemergence treatments of Geigy 30026 at 1 lb/A, atrazine at 1 and 2 lb/A and the early postemergence treatment of atrazine at 2 lb/A resulted in good broadleaved weed control but poor control of grasses. Preemergence treatments of Zytrol [O-(2,4-dichlorophenyl) O-methyl isopropylphosphoramidothioate] at 10 lb/A, Dacthal (dimethyl 2,3,5,6-tetrachloroterephthalate) at 5 and 10 lb/A, and Diphenamid (N,N-dimethyl-2,2-diphenylacetamide) at 3 lb/A resulted in good control of weed grasses but poor control of broadleaved weeds. Preemergence treatments of Stauffer R-3400 (2-benzylmercapto-4,6-dimethylpyrimidine) at 5 and 10 lb/A and early postemergence treatments with amitrole-T at 3/4 lb/A, and di-N,N-dimethylcocoamine salt of endothal at 2 lb/A resulted in poor control of both broadleaved weeds and grasses. Significant stunting of the grain sorghum as indicated by sorghum heights taken July 15 resulted from preemergence treatments of propazine at 4 lb/A, Casoron at 2 lb/A, DuPont 326 at 1.5 and 3 lb/A, and Diphenamid at 3 lb/A; and early postemergence treatments with DNBP at 3 lb/A and di-N,N-dimethycocoamine salt of endothal at 2 and 4 lb/A. Significant stand reductions resulted from preemergence treatments of Casoron at 2 lb/A, DuPont 326 at 3 lb/A and the early postemergence treatment of di-N,N-dimethylcocoamine salt of endothal at 4 lb/A.

Effect of 2,4-D on yields and root growth of RS 610 and Wheatland grain sorghum. A.F. Wiese and H.E. Rea. A butoxyethanol ester formulation of 2,4-D

was applied at 1/2 and 2 pounds per acre to RS 610 and Wheatland sorghum when each variety was 4, 8, and 18 inches tall. Separate plots were used for each rate of herbicide at each stage of growth. The experimental design was a split plot with 3 replications. The soil type was Pullman clay loam. The crop was well fertilized, flood irrigated and received a total of 25 inches of rainfall and irrigation. Yields of RS 610 were not significantly reduced by the 1/2 pound rate at any stage of growth, but yields were reduced about 20 percent by 2 pounds of 2,4-D per acre at the 4- and 8-inch stages. Yields of RS 610 were not reduced by either rate of 2,4-D when the sorghum was 18 inches tall. At both the 4- and 8-inch stages 1/2 and 2 pounds of 2,4-D reduced yields of Wheatland 30 and 55 percent, respectively. At the 18-inch stage, the 1/2 pound rate did not reduce yields of Wheatland, but the 2 pound rate reduced yields about 20 percent. Yield reductions were caused by both decreased numbers and smaller heads of grain. The untreated plots of RS 610 and Wheatland yielded 9,630 and 5,580 pounds per acre, respectively. Studies of root and top growth of the 2 varieties showed that 2 weeks after treatment of 4-inch sorghum, top growth was markedly decreased by both rates of 2,4-D. Root growth in the top foot of soil of RS 610 was not affected by the low rate of 2,4-D but was reduced 70 percent by the heavy rate. Root growth of Wheatland was greatly reduced by both rates of 2,4-D. Five weeks after treatment of 4-inch sorghum, root growth measurements showed that RS 610 had recovered but Wheatland had not. Five weeks after treatment, top growth was reduced by the 2 pound rate in RS 610 and by both rates in Wheatland. (Contribution of the Southwestern Great Plains Field Station, Bushland, Texas, Texas Agricultural Experiment Station and USDA cooperation.) Approved as TAES T.A. 3936.

SMALL GRAINS

Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) for the control of wild oats in varieties of spring wheat. Dryden, R.D. Avadex applied at 0, 1.0, 1.5 and 2.0 lb.A in 5 gal/A of water was incorporated with a discer at 3 inches in depth before planting wheat. Wild oats were seeded across the plots. As a result of grain losses by birds, yields of straw only were analysed.

Variety	Percent reduction of wheat plants following treatment lb/A				Yield of wheat straw* cwt/A, following treatments, lb/A			
	1.0	1.5	2.0	Mean	0	1.0	1.5	2.0
Rescue	30	46	80	52	42.5	48.8	42.4	31.7
Chinook	35	51	69	52	36.0	43.6	38.0	37.3
Canthatch	23	66	74	54	30.0	34.5	22.6	22.7
Saunders	15	48	67	43	26.9	31.6	25.1	18.3
Pembina	23	68	72	54	28.1	27.2	22.1	15.9
Selkirk	39	71	78	63	29.8	23.6	16.3	12.0
Mean	28	58	73	53	32.2	34.9	27.8	23.0

*Straw and stubble

Avadex at 1 lb/A or more produced a significant reduction in average numbers of wheat plants. Average crop injury was most severe with the variety Selkirk (63%) and least with Saunders (43%). Straw yields were greater than the check for varieties, Rescue, Chinook, Canthatch and Saunders at 1 lb/A. A significant variety x rate interaction occurred in the analysis of straw yields. Wild oats were reduced 79% at 1 lb/A, 96% at 1.5, and 98% at 2.0 lb/A. The average number of wild oat plants per square yard on the untreated checks was 97. (Contributed by the Experimental Farm, Brandon, Man.)

Methods of incorporating Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) for wild oat control in Selkirk wheat. Dryden, R.D. The following operations were used to incorporate Avadex at 0, 1.0 and 1.5 lb/A on summerfallow: (1) seed, spray, harrow (2) spray, seed (3) spray, disc at 3-inch depth. Each method was duplicated, in a 4 replicate experiment, to permit seeding with a discer seeder and a single disc press drill. Wild oats were seeded across the plots after incorporation. As a result of bird damage yields of straw only were analyzed. Numbers of wheat plants per sq. yd. at harvest on the untreated check were discer, 159 and drill, 96. Numbers of wild oats were discer, 34, and drill, 40.

Method of incorporation and seeding	Percent reduction of plants				Yields of wheat straw and stubble cwt/A		
	Wheat		Wild oats				
Rate	1.0	1.5	1.0	1.5	0	1.0	1.5
1. Discer	14	28	83	79	28.7	38.0	37.0
Drill	12	32	72	74	28.1	34.9	33.1
2. Discer	58	81	74	90	30.1	35.5	27.1
Drill	56	60	53	78	23.8	20.8	20.2
3. Discer	42	71	88	97	28.4	27.3	25.0
Drill	65	85	71	93	27.0	33.0	16.8

Method 1 produced significantly more straw than other incorporations. Crop injury was also much lower by this method. The best wild oat control was obtained by the disc-incorporation-discer-seeding method. (Contributed by the Experimental Farm, Brandon, Man.)

Dates of seeding Selkirk wheat following applications of Avadex (2,3-dichloroallyl diisopropylthiolcarbamate). Dryden, R.D. Avadex at 0, 1.0 and 1.5 lb/A was incorporated on May 17 with a discer at a 3-inch depth. Wild oats were then seeded across the plots. Wheat was seeded at intervals of 3 or 4 days beginning on May 19. Due to bird damage plot yields were determined from the weight of straw produced. Plant stands at harvest were compared to the untreated check. The average check plot produced 47 wild oat plants per square yard.

Seeding date	Wheat plants per sq.yd.	Percent reduction of plants Wheat		Wild oats		Yield of wheat straw and stubble cwt/A		
Rate	0	1.0	1.5	1.0	1.5	0	1.0	1.5
May 19	86	27	60	91	93	17.6	18.8	15.1
" 23	128	43	59	79	93	20.5	24.5	17.8
" 26	126	50	72	85	93	20.3	24.4	16.2
" 30	114	27	70	67	86	16.7	22.2	15.1
June 2	129	46	68	67	94	17.7	20.5	21.5
" 6	72	32	56	85	88	13.8	17.5	14.6

Different dates of seeding resulted in no significant differences in numbers of wheat plants, wild oat control or crop yields. Rates of application had a significant effect on the numbers of wheat plants and wild oat control. (Contributed by the Experimental Farm, Brandon.)

Applications of Avadex (2,3-dichloroallyl diisopropylthiol carbamate) for the control of wild oats in three varieties of durum wheat. Dryden, R.D. Avadex applied at 0, 1.0, 1.5 and 2.0 lb/A in 5 gal/A of water was incorporated on summerfallow with a discer at 3 inches in depth before planting wheat. Wild oats were seeded across the plots. Plant stands at harvest were compared with the untreated check.

Variety	Wheat plants percent reduction			Yield of wheat, bu/A			
Rate	1.0	1.5	2.0	0	1.0	1.5	2.0
Pelissier	24	54	72	23.0	31.9	24.5	20.9
Stewart	34	56	76	22.4	27.0	22.4	16.3
Ramsey	61	71	78	20.8	22.4	13.9	12.3

Yield increases of grain with Pelissier were larger than those of Steward or Ramsey at 1.0 and 1.5 lb/A. The interaction of varieties x rates was not significant on numbers of wheat plants or crop yields. Significant reductions in the number of wheat and wild oat plants per square yard occurred at 1 lb/A or

more. The average numbers of wheat and wild oat plants on the check were 85 and 103, respectively. Average wild oat control was 77, 83 and 96% at 1.0, 1.5 and 2.0 lb/A. (Contributed by the Experimental Farm, Brandon, Man.)

Applications of Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) for the control of wild oats in ten varieties of barley. Dryden, R.D. Avadex applied at 0, 1.0, 1.5 and 2.0 lb/A in 5 gal/A of water was incorporated with a discer before planting the barley varieties. Wild oats were then seeded across the plots. Plant stands at harvest were compared to the untreated check.

Variety	Barley plants percent reduction			Yield of barley, bu/A			
Rate	1.0	1.5	2.0	0	1.0	1.5	2.0
Palliser	-24	11	16	55.2	60.9	60.2	59.6
Vantage	- 6	42	33	45.2	62.3	66.6	59.6
Jubilee	-34	45	53	41.6	59.5	62.8	59.6
Betzes	14	37	52	43.3	56.8	61.3	56.9
Hannchen	- 4	25	47	38.0	50.6	62.4	61.2
Husky	52	67	51	40.2	57.9	45.9	50.2
Parkland	40	44	64	32.4	48.1	54.2	54.2
Montcalm	41	49	59	35.7	46.4	47.1	46.8
Compana	8	22	30	26.2	40.6	53.0	49.8
Olli	15	33	48	12.5	24.4	33.0	32.0
Mean	10	38	45	37.0	50.8	54.6	53.0

Average wild oat plants per square yard were 224, 64, 7, and 2, for check, 1.0, 1.5, and 2.0 lb/A, respectively. The greatest reduction in barley plants (average check 112/sq. yd.) occurred with the varieties Husky, Parkland and Montcalm. A significant variety x rate interaction was obtained on analysis of numbers of barley plants. (Contributed by the Experimental Farm, Brandon, Man.)

Delayed seeding of barley after pre-planting treatment with 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) for wild oat control. Sexsmith, J.J. Wild oats were broadcast seeded on dry-land fallow at Lethbridge on May 25, 1961. The following day Avadex treatments were applied at 0, 1, and 1½ lb/A and incorporated to a depth of approximately 2 in. by two workings with a double disk. Barley (var. Compana) was seeded to quadruplicate plots at six dates after treatment (0, 3, 6, 9, 12, and 15 days). No plant counts were taken after emergence, but stem counts of barley and wild oats were made at time of harvest, for barley on six 3-ft. row lengths per plot, and for the wild oats on the two sq. yd. areas sampled for barley yield. Results: Wild oats grew poorly on check plots, and recorded stem counts per sq. yd. varied from 0 to 21, the general average being 5 stems/sq. yd. Avadex treatments gave an estimated 95% control. Regardless of seeding delay, all barley stands were reduced by the Avadex, stand reduction estimated as approximately 15% to 20%. No significant differences in barley stem counts or grain yield were obtained. (Contributed by Canada Agriculture, Research Station, Lethbridge, Alberta.)

OTHER FIELD CROPS

Herbicides on sugar beets. Ascheman, R.E., Zielke, R.C., and Stroube, E.W. Sugar beets were planted in 32-inch rows in Toledo fine sandy loam on the Crecelius farm (CF) on May 2, 1961, and in Hoytville silty clay on the Northwest Substation (NW) on May 3 and 4. Triplicate plots, four rows wide and 45 feet long randomized in blocks, were treated with each rate of each herbicide. The liquid and wettable powder formulations were applied in water at 40 gpa. All plots at the Crecelius farm had a natural infestation of smartweed and scattered infestations of lambsquarters and nutsedge. At the Northwest Substation, all plots were infested with smartweed, ragweed and annual grasses. The preplanting and preemergence treatments were rated on May 29 at the Crecelius farm and on June 10 at the Northwest Substation. Postemergence treatments were evaluated on June 20. All ratings were the average of three replications and were made before blocking or cultivation. The planting was later than usual due to a cool, wet spring but the soil was warm and moist at planting. The early growing season was wet at the Crecelius farm and dry at the Northwest Substation. EPTC and propyl ethyl-n-butylthiolcarbamate (Tillam) applied preplanting and incorporated at 4 and 6 lb/A controlled smartweed from 80 to 85%, ragweed from 90 to 98% and grasses from 97 to 100% at NW. These herbicides applied preemergence and not incorporated at 4 and 6 lb/A as liquid and granules resulted in from 60 to 80% control of the broadleaf and grass weeds at both locations. EPTC granules applied preemergence at 4 and 6 lb/A controlled 33 and 23% of yellow nutsedge while the liquid application resulted in no control at CF. Similarly, Tillam granules at 4 and 6 lb/A reduced the nutsedge 30 and 40% but when applied as a liquid there was little or no reduction of nutsedge. Endothal applied preemergence at both locations at 4 and 6 lb/A as liquid and granules controlled broadleaf weeds from 50 to 75% and the grasses from 65 to 82%. Endothal plus TCA applied preemergence at 2 + 5 and 3 + 5 lb/A reduced the weeds from 82 to 92% at NW. At CF these treatments reduced the broadleaf weeds from 50 to 63%. Endothal plus dalapon at 2 + 4 and 3 + 4 lb/A controlled from 70 to 88% of the weeds at NW and from 50 to 67% of the broadleaf weeds at CF. TCA applied preemergence at 6 lb/A reduced the broadleaf weeds 90% at NW and 60% at CF and reduced the grasses 97% at NW. 2-Methoxy-4-methylamino-6-isopropyl-s-triazine (G-32292) applied preemergence at 3/8 lb/A controlled from 40 to 60% of the weeds and at 1 1/2 lb/A from 50 to 70% at both locations. Di-oleyl amine salt of endothal (TD-66) applied preemergence at 6 and 10 lb/A reduced the weeds from 60 to 63% at NW and from 10 to 50% at CF. Mono-oleyl amine salt of endothal (TD-266) at 6 lb/A reduced the weeds 55% at NW and 15% at CF and at 10 lb/A, 65% at NW and 57% at CF. CDEC at 6 lb/A resulted in from 57 to 70% weed control at both locations. CDAA plus CDEC at 5 + 6 lb/A reduced the weeds from 80 to 95%. Endothal applied postemergence (8 to 10-leaf stage) on June 10 at 3/4 and 1 1/2 lb/A reduced the smartweed infestation 93% and the ragweed and grasses from 40 to 50% at NW. Di-N,N-dimethylcocoamine salt of endothal (TD-47) applied postemergence at 3/4 and 1 1/2 lb. controlled from 85 to 95% of the broadleaf weeds and 76% of the grasses at NW. CIPC applied postemergence at 4 and 6 lb/A resulted in 43 and 65% control of smartweed, 27 and 30% of ragweed and 37 and 40% of the grasses at NW. Slight injury to the sugar beets was observed in plots treated preplanting with Tillam and EPTC at 4 lb/A, preemergence EPTC granules at 4 and 6 lb/A, endothal granules at 6 lb/A, endothal plus TCA at 3 + 5 lb/A endothal plus dalapon at 3 + 4 lb/A, TCA at 6 lb/A, G-32292 at 1 1/2 lb/A and all postemergence treatments. This slight injury was observed when the weeds ratings were made but later in the season there were no noticeable injury symptoms in these plots. Heavy injury was observed in plots treated preplanting with EPTC at 6 lb/A, preemergence with CDAA + CDEC at 5 + 6 lb/A and

postemergence with TD-47 at 1 1/2 lb/A. (The Ohio Agricultural Experiment Station.)

Abstract for the 1961 North Central
Weed Control Conference Research Report

Preemergence herbicides on castorbeans. Burnside, O.C., and Kittock, D.L. Baker 296 castorbeans were planted about May 10, 1961, at Hastings, Lincoln, and McCook, Nebraska. Preemergence herbicides were applied within four days after planting to quadruplicated 1 1/2 square rod plots. Castorbean injury notes were taken one month after spraying, and weed yields were obtained by clipping 16 square feet per plot about July 15. Predominate weed species on an over-dry basis at Lincoln and McCook were broadleaves; whereas at Hastings there was nearly an equal proportion of broadleaf and grassy weeds. Plots were not cultivated until after weed yields were taken. Herbicide treatments, castorbean injury and weed yeidls appear in the following table:

Treatment	Rate lb/A	Castorbean injury*	Oven-dry weed yields lb/A		
			Hastings	Lincoln	McCook
None (check)	-	0	1140	330	870
Hand-weeded	-	0	0	0	0
Amiben	1	0	500	170	270
Amiben	2	2	570	60	40
Amiben + TCA	1 + 5	4	610	80	450
Casoron (2,6-dichlorobenzonitrile)	2	0	1160	310	180
Casoron	4	0	1170	260	5
CDAA	6	1	950	80	40
CDAA + T (trichlorobenzyl chloride)	3.3 + 6.7	3	610	180	40
CDAA + T	5 + 10	5	760	110	10
CDAA + T	6.6 + 13.4	4	730	90	10
CDEC	4	0	660	300	590
CDEC	8	1	750	240	170
CIPC	4	1	660	170	60
CIPC	8	3	650	220	350
Diuron	3	5	790	80	40
DNBP	8	3	1360	250	190
Endothal	8	1	800	380	340
EPTC	3	1	920	180	10
DPTC	6	1	500	140	10
NPA	4	1	400	220	0
TCA	5	4	680	360	890
TCA	10	4	450	230	240
Zytron (O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate)	10	1	790	180	110
Zytron	20	0	900	80	140

*Injury ratings are averaged over the three locations.
Injury scale: 0-no injury; 1,2,3 - slight; 4,5,6 - moderate; 7,8,9 - severe; and 10 - complete kill.

There was significantly less weed control at Hastings compared to Lincoln and McCook. Herbicides that show some promise for selective weed control in castorbeans are amiben, Casoron, CDAA, EPTC, NPA, and Zytron. Other herbicides were either too injurious to castorbeans or gave poor weed control. (Contribution of the Department of Agronomy, University of Nebraska, Lincoln, Nebraska. Published with the approval of the Director as paper No. 1172a, Journal Series, Nebraska Agr. Expt. Sta.)

Herbicides for weed control in white beans. Chubb, W.O. Sanilac bean plots (on a fertile silty clay loam) were treated: just before seeding with Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) at 1.5 and 2 lb/A and CP 23426 (2,3,3-trichloroallyl diisopropylthiolcarbamate) at 1.5 lb/A, incorporated to about three inches with a two-way disk; immediately after sowing with EPTC at 2 and 4 lb/A and Tillam (propyl ethyl-n-butylthiolcarbamate) at 3 and 6 lb/A incorporated by hand raking, amiben, Casoron (2,6-dichlorobenzonitrile) and trietazine at 2 and 4 lb/A and CDAA at 4 lb/A mixed with DNBP and N5778 (4,6-dinitro-3-sec-butylphenol acetate) at 4 lb/A; with barban at 12 oz/A when wild oats were in the two leaf and beans in the first trifoliate leaf stage. The total spray volumes (water diluent) were 5 gpa for barban and 10 gpa for other materials. Moisture was adequate at sowing. A hot, dry period of six weeks followed (rainfall 0.19 inches, temperatures ranging to 99°F.). Moisture supply was adequate for the remainder of the season. No material gave a significant degree of green foxtail contro. Avadex, CP 23426 and barban gave a significant degree of wild oat control. On plots treated with these materials the release from competition with wild oats resulted in an approximately doubled population of green foxtail. The yields of dry beans (cwt/A) and counts per 4 sq. ft. of wild oats and green foxtail were respectively: Weeded check 41.0, 0, 0; untreated check 11.5, 63, 62; Avadex 1.5 lb/A 19.0, 20, 122; 2 lb/A 17.2, 7, 135; CP 23426 1.5 lb/A 18.9, 16, 126; barban 12 oz/A 18.2, 7, 166; Average all other treatments 15.4, 39, 79. (Contributed by Canada Agriculture, Research Branch, Special Crops Substation, Portage la Prairie, Manitoba.)

Chemical weed control in processing peas grown in Knik silt loam soil, 1961. Dinkel, D.H. Midfreezer peas were drilled 2.5" deep in Knik silt loam soil on May 16 at Palmer, Alaska. The following herbicide treatments were applied May 26, preemergence (rates per acre): Two lb. trietazine, 4 lb. N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solan), 4 lb. 2,6-dichlorobenzonitrile (Casoron), 8 lb. CDEC, 2 lb. 2,4-bis(isopropylamino)-6-mercapto-s-triazine (Prometryne) and 6 lb. DNBP. Postemergence treatments of 1.5 lb/A 4-(2,4-DB) and 1.5 lb/A MCPA were applied June 8. Herbicides were applied to plots 4' by 15' in each of four replicates at 30 psi in 40 gpa of water. The air temperature at the time of preemergence application was 63°F, the soil surface was dry and no rainfall was recorded during the next two weeks. The average maximum air temperature for the week following application was 62°F. The air temperature at postemergence application was 65°F, soil surface dry and 2" of rainfall was recorded during the week following application. Weeds, consisting of Chenopodium album, Spergula arvensis, Thlaspi arvense, Stellaria media, Capsella bursa-pastoris, Brassica Kaber and a few other broadleaved weeds, were emerging at preemergence application. Four lb. Solan and 6 lb. DNBP gave more than 80 percent weed control without injury to peas until peas were able to compete favorably. One and one-half lb. MCPA and 1.5 lb. 4-(2,4-DB) gave acceptable weed control but retarded development of peas causing them to be about 1 week later in maturing. Other herbicides gave unsatisfactory weed control but reduced weed growth more than 50 percent without injury to peas. (Contribution from the Alaska Agri. Exp. Sta., Palmer.)

Chemical weed control in potatoes grown in Knik silt loam soil, 1961. Dinkel, D.H. Alaska 114 potatoes planted in Knik silt loam soil at Palmer, Alaska, June 1, were sprayed with the following herbicides (rates per acre): PREEMERGENCE (June 19). Four lb. trietazine, 4 lb. ipazine, 4 lb. 2,4-bis(isopropylamino)-6-mercapto-s-triazine (Prometryne), 4 lb. 2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine (Atrametryne), 6 lb. DNBP and 6 lb. N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solan). POSTEMERGENCE (July 6, 1961). Four lb. ipazine, 4 lb. Prometryne, 4 lb. Solan and 4 lb. Atrametryne. Herbicides were applied to plots 1.5' by 18' in each of five replicates at 30 psi in 40 gpa of water. The air temperature at the time of preemergence application was 79°F, the soil surface was dry and approximately 1" of rainfall was recorded during the week following application. The average maximum air temperature during the week following preemergence application was 64°F. The air temperature at the time of postemergence application was 67°F, the soil surface dry, potatoes 4" high and .64" rainfall was recorded the sixth day after spraying. The average maximum air temperature during the week following postemergence application was 69°F. Weeds were primarily *Chenopodium album*, *Spergula arvensis*, *Thlaspi arvense*, *Stellaria media*, *Capsella bursa-pastoris*, *Brassica arvensis* and a few other miscellaneous broadleaved weeds. All herbicides were used with normal cultivation and hilling practices. Preemergence herbicides all gave season long weed control without injury to potatoes or reduction in yields. All postemergence herbicides gave season long weed control but severely injured potatoes and decreased yields. (Contribution from The Alaska Agric. Exp. Sta., Palmer.)

Chemical weed control in sugar beets grown in Knik silt loam soil, 1961. Dinkel, D.H. A monogerm line of sugar beets, F59-569HO, from the West Coast Beet Seed Company was seeded May 12 in Knik silt loam soil at Palmer, Alaska. The following herbicides were applied May 23, preemergence, to irrigated and non-irrigated plots replicated three times (rates, lb/A): 4 and 8 endothal, 4 endothal (granular), 6 EPTC, 6 EPTC (granular, pre-planting), 8 CDEC, 4 CDAA, 6 propyl ethyl-n-butylthiolcarbamate (Tillam), 4 dalapon + 4 endothal, 4 endothal + 4 CDEC and 4 each of endothal derivatives TD-268, TD-269 and TD-270. The following postemergence herbicides were applied June 9 (rates, lb/A): 6 endothal, 1/2 and 3/4 barban, 4 dalapon and 4 endothal + 1/2 barban. Herbicides were applied to plots 1.5' by 30' at 30 psi in 40 gpa of water. Irrigated plots received 1" of water May 30. The air temperature at the preemergence application was 64°F. The soil surface was dry and only a trace of rainfall was recorded during the week following. The air temperature at the postemergence application was 68°F, the soil surface was dry and .68" rainfall was recorded during the week following. The average maximum air temperature during the week following preemergence application was 62°F. and following postemergence was 64°F. Weeds were primarily *Chenopodium album*, *Spergula arvensis*, *Thlaspi arvense*, *Stellaria media*, *Capsella bursa-pastoris*, *Brassica Kaber* and a few other miscellaneous broadleaved weeds. No herbicides gave more than 50 percent control of weeds which was considered unacceptable commercially. Four lb/A CDAA, 8 lb/A CDEC and 4 lb/A endothal + 4 lb/A CDEC preemergence and 4 lb/A dalapon postemergence caused slight stunting but did not significantly injure sugar beets. One-half and 3/4 lb/A barban treated plots were completely free from lambsquarters. Endothal and endothal derivatives all gave noticeable reduction in weed growth. No difference in early effectiveness of herbicides due to irrigation could be detected and the large number of weeds present in all plots masked any differences in residual herbicide action if present. (Contribution from the Alaska Agri. Exp. Sta., Palmer.)

Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) for the control of wild oats in seven varieties of flax. Dryden, R.D. Avadex, applied at 0, 1.0, 1.5 and 2.0 lb/A in 5 gal/A of water, was incorporated with a discer to 3 inches before planting the flax varieties. Wild oats were then seeded across the plots.

Variety	No. wild oat plants at harvest per sq. yd.				Yield of flax, bu/A			
Rate	0	1.0	1.5	2.0	0	1.0	1.5	2.0
Norland	51	3	6	2	15.9	21.3	25.8	23.3
Sheyenne	34	6	9	2	16.3	21.9	18.3	23.0
Raja	51	13	4	2	11.4	18.7	19.4	24.5
Marine	60	8	14	2	13.2	18.9	19.0	22.2
Rocket	49	5	3	2	11.0	20.1	19.7	21.6
Redwood	72	12	6	2	9.3	18.9	19.0	22.5
Redwing	65	12	4	5	7.4	15.8	18.0	22.6

Avadex at 1 lb/A or more, significantly reduced the number of wild oats per square yard and increased yields of all flax varieties. Differences between varieties were not significant. (Contributed by the Experimental Farm, Brandon, Man.)

Applications of barban (Carbyne) on flax varieties (without wild oats). Dryden, R.D. Spray treatments of Carbyne at 0, 6, and 8 oz/A in 5 gal/A of water were made on 7 flax varieties at the 6-8 leaf and 12-14 leaf stages to determine the effect of the chemical on different varieties of this crop.

Variety	Yield of flax varieties, bu/A							
	Stage 1, rate				Stage 2, rate			
	0	6	8	Mean	0	6	8	Mean
Sheyene	14.2	14.7	13.4	14.1	12.1	11.7	11.0	11.6
Norland	15.0	13.3	12.6	13.6	12.6	11.3	11.7	11.9
Rocket	13.4	13.8	13.1	13.4	13.8	12.3	11.4	12.5
Redwood	11.2	11.5	12.9	11.8	13.8	10.0	11.8	11.9
Marine	9.0	9.6	8.5	9.0	10.1	7.7	6.7	8.2
Redwing	8.6	9.4	8.0	8.6	8.7	6.9	8.2	7.9
Raja	8.1	7.0	7.6	7.6	8.4	6.8	7.1	7.4
Mean	11.4	11.3	10.9	11.2	11.4	9.5	9.7	10.2

There was no significatn interaction between varieties and Carbyne treatments. The mean yield of applications at stage 2 was significantly lower than at stage 1. (Contributed by the Experimental Farm, Brandon, Man.)

Effect of rates of barban applied at 3 growth stages of Marine flax and wild oats. Friesen, H.A. Barban (Carbyne) at nil, 2, 4 and 6 oz/A was sprayed in 5 gal/A of water at 3 growth stages of flax, viz: 1) 6-leaf; 2) 10-leaf and 3) 15-leaf; at these times the wild oats were in the 1½-leaf, 3½-leaf and 4-leaf growth stages, respectively. Emergence of the flax in 1961 was rather

uneven due to the very dry surface soil, but the wild oats which had been planted deeper into moist soil emerged uniformly. Barban at 2 oz/A resulted in no measurable effect on either the wild oats or flax at any growth stage. The 4 and 6 oz/A dosages sprayed at the $1\frac{1}{2}$-leaf stage of the wild oats reduced the numbers of the weed plants by some 50 and 60 per cent, respectively. These treatments also increased the yield of flax. Where applied at the 2 later growth stages the wild oat control was very unsatisfactory, less than 20 per cent. Neither of the two later treatments significantly reduced the number of flax plants or the yield of flax seed. This was also true when the experiment was repeated on Marine flax grown on weed free plots ("flax only" column).

Flax stage	Barban oz/A	Wild oats/sq.yd. Plants	Culms	W. oats cwt/A	Flax Plts/sq.yd.	bu/A	Flax only Plts	Bu/A
6 leaf	0	80	214	287	122	8.4	119	13.1
	2	82	220	269	119	10.8	139	15.1
	4	39	135	172	132	11.0	120	14.2
	6	27	98	128	140	11.6	124	13.8
10 leaf	6	64	191	236	127	8.7	110	12.5
15 leaf	6	74	208	268	116	7.5	121	10.7

(Contributed by the Experimental Farm, Lacombe, Alta.)

Abstract for the 1961 North Central
Weed Control Conference Research Report

Chemical and competitive control of weeds during sweetclover establishment. Gorz, H.J. and Burnside, O.C. Madrid and Huban sweetclover were planted alone and with Nemaha oats in Wymore silty clay loam at Lincoln, Nebraska, on April 18, 1961. Preemergence applications of amiben were applied April 21 to quadruplicated 7- by 20-foot plots. No rain fell for 15 days after the herbicide application, at which time 1.4 inches fell. Major weed species present were *Setaria* spp., *Polygonum* spp., *Amaranthus* spp., *Chenopodium album* L., *Helianthus annuus* L., and *Oxalis stricta* L. Weed and crop yields were harvested on July 10. Weed yields were nil when oats were present, and weed yields from plots without oats are presented as follows:

Treatment	Rate lb/A	Oven-dry weed yield lb/A No crop	Madrid	Hubam	Mean
None (check	0	3020	1240	740	1670 a*
Amiben	1	2190	510	230	980 b
Amiben	2	1780	280	50	700 bc
Amiben	4	1020	120	40	390 c
Mean		2000 a	540 b	260 c	

*Numbers within treatments followed by the same letters do not differ significantly at the 5 percent level according to Duncan's multiple range test.

Weed yields were significantly reduced with increasing amiben applications. The presence of sweetclover in conjunction with amiben significantly increased

weed control; and Huban, an annual, was more competitive against weeds than Madrid, a biennial. Sweetclover yields, averaged over amiben treatments, were 90 and 1290 lb/A for Madrid and 160 and 2030 for Hubam when oats were present and absent, respectively. The presence of oats caused a 13-14 fold reduction in sweetclover yields. Oat yields, averaged over sweetclover treatments, were 54, 56, 54 and 52 bu/A when exposed to amiben applications of 0, 1, 2 and 4 lb/A, respectively. These yields were not significantly different. When yields were averaged over amiben treatments oats produced 52, 53 and 57 bu/A when grown with Madrid sweetclover, Hubam sweetclover and alone, respectively. The presence of sweetclover significantly reduced oat yields. (Contribution of the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture and the Department of Agronomy, University of Nebraska, Lincoln, Nebraska. Published with the approval of the Director as paper No. 1167a, Journal Series, Nebraska Agr. Exp. Sta.)

Preemergence weed control in big bluestem. McCarty, M.K., L.C. Newell and F.S. Davis. A two-year-old stand of big bluestem seeded in rows for seed production was given preemergence treatment with herbicides for control of weeds. The following herbicides were used at 2 and 4 lb/A: atrazine, diuron, 2-methylmercapto-4-ethylamino-6-isopropylamino-s-triazine (Atrametryne), 2-methoxy-3,6-dichlorobenzoic acid (Banvel D), 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (DuPont 326), and N,N-dimethyl-2,2-diphenylacetamide (U-4513) (Diphenamid). A weedy and a hand-weeded check were also included. Plots were 7 x 30 ft. with 4 replications. Herbicides were applied April 26, 1961 following an overall burning treatment and before any growth of big bluestem appeared. Atrazine and atrametryne at 4 lb/A and Banvel D at 2 and 4 lb/A gave excellent control of broadleaved weeds. Atrazine and Atrametryne gave good control of weedy grasses early in the season, but in late summer a stand of fall panicgrass developed. None of the treatments appeared to hurt the big bluestem. However, even where early weed control was adequate, forage production averaged only 3000 to 3500 lb/A compared with 5600 lb/A in the hand-weeded check and 1200 lb/A in the untreated check. (Cooperative Investigations of Crops Research Division, Agr. Res. Service, U.S.D.A. and Agronomy Department, University of Nebraska. Paper No. 1166a, Journal Series, Nebraska Agricultural Experiment Station.)

Effect of 2,4-D and related compounds on seedling grasses. Murphy, W.J., Fletchall, O.H., and Peters, E.J. Seedling Kentucky bluegrass, orchardgrass, tall fescue, and timothy were studied in the greenhouse and field using different types, rates and dates of treatment with phenoxy compounds. Greenhouse treatments under weed-free conditions consisted of spray applications of 1/2, 3/4, and 1 lb/A of the dimethylamine salt of 2,4-D and 3/4 and 1-1/2 lb/A of the dimethylamine salt of 4-(2,4-DB) in 40 gallons of water applied 3 weeks and 6 weeks after seedling emergence. Treatments made 3 weeks following emergence resulted in slight to moderate damage, while those made 6 weeks following emergence gave no apparent injury. Recovery occurred in all cases. Air dry weights of top growth harvested 5 weeks after treatment showed no statistically significant differences between rates of application or between treatments and the checks. Kentucky bluegrass exhibited the greatest damage, followed in order by orchardgrass, timothy, and tall fescue. Damage was greater as rates increased. Effects of 3/4 lb/A of 4-(2,4-DB) were about equal to 1/2 lb/A 2,4-D. The 1-1/2 lb/A rate of 4-(2,4-DB) gave damage ratings comparable to 3/4 lb/A of 2,4-D. Spring seedings in the field were treated with 1/2 lb. and 1 lb/A of the dimethylamine salt of 2,4-D, 1-1/2 lb/A of the dimethylamine salt of 4-(2,4-DB), and 1/2 lb. and 1 lb/A of the butyl ester of 2,4-D applied 2, 4, and 6 weeks

after emergence of the grasses. A natural infestation of weeds occurred. Slight to moderately heavy damage to the seedling grasses resulted from the treatments at the first date, very slight to moderately light damage at the second date, and no visible effect at the third date. Kentucky bluegrass was most affected, orchardgrass was next, and timothy and fescue appeared equal. 1/2 lb/A of 2,4-D amine gave the least damage, 1-1/2 lb/A of 2,4-DB was next, 1 lb/A 2,4-D amine and 1/2 lb/A 2,4-D ester were nearly equal and 1 lb/A 2,4-D ester showed most damage. All treatments at all dates gave effective control of broadleaved weeds (principally smartweeds, ragweeds and lambsquarter). Damaged grass seedlings made rapid recovery during the favorable season. Point quadrat readings of seedling grass taken 40 days after final treatments showed only small differences between rates, dates, or types of treatment, but treated plots in general had significantly higher readings than checks. Kentucky bluegrass showed less difference between treatments and checks than the other grasses. (University of Missouri, Columbia, Missouri.)

Herbicides for weed control in alfalfa. Peters, Elroy J. 1/ Vernal alfalfa was sown on April 19, 1961 at a rate of 12 lb/A. Diphenamid (N,N-dimethyl-2,2-diphenylacetamide) was applied preemergence on April 20 at rates of 2, 4, and 8 lb/A and postemergence applications of 1 lb/A of 4-(2,4-DB) and a mixture of 1 lb/A of 4-(2,4-DB) and 2 lb/A of dalapon were made on June 12. On July 17, stand counts showed that the 4-lb. rate of Diphenamid had reduced alfalfa stands about 10% while the 8-lb. rate had reduced stands 50% as compared with the other treatments or none (check). Good control of barnyardgrass (Beauv.) and fall panicum resulted at all rates. Diphenamid did not control common ragweed. Good broadleaved weed control was obtained with 4-(2,4-DB) and both weed grasses and broadleaves were controlled with the 4-(2,4-DB)-dalapon mixture. (Cooperative contribution of the Crops Research Division, Agr. Res. Serv., U.S.D.A. and Missouri Agr. Exp. Sta.)

Tolerance to herbicides of crop species of potential industrial uses. Robinson, R.G. Species were rated for tolerance to preemergence sprays of CDAA at 4 lb/A, EPTC at 3 lb/A, amiben at 3 lb/A, and propazine at 3 lb/A. EPTC was raked into the soil after spraying. Spray volumes of 40 gpa were used. Trials were conducted from 1959-61 at Rosemount, Minn. Two dates of planting were used for most species each year. Replication of spray treatments for each date of planting varied from 1 to 3. Crop tolerance was rated on a scale of 0, no injury, to 5, killed. Ratings of 0-2 indicate possible selective use of the herbicide on that species. Figure in parenthesis after the rating is the number of years of trial. (Table on next page). (Contribution from the Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 4742, Sci. Jour. Series, Minn. Agric. Exp't. Sta.)

Crop	CDAA	EPTC	Amiben	Propazine
Brassica campestris	3(3)	3(3)	3(1)	5(1)
Brassica napus	2(2)	2(2)	3(1)	5(1)
Crambe abyssinica	2(3)	3(3)	3(1)	5(1)
Eruca sativa	1(3)	2(3)	2(1)	5(1)
Helianthus annuus	1(5)	0(3)	0(2)	3(1)
Hibiscus cannabinus	1(1)	0(1)	0(1)	4(1)
Raphanus sativus	1(3)	2(3)	2(1)	5(1)
Limnanthes douglassii	2(1)	3(1)	2(1)	5(1)
Rudbeckia bicolor	4(2)	4(2)	2(1)	5(1)
Sorghum almum	1(3)	5(1)	4(1)	1(2)
Vicia faba	1(1)	3(1)	2(1)	3(1)
Helianthus maximiliani	2(1)	0(1)	1(1)	--
Crotalaria juncea	1(1)	--	2(1)	--
Daucus carota	2(3)	2(1)	--	--
Dimorphotheca auriantiaca	2(1)	3(1)	--	--
Euphorbia marginata	1(1)	3(1)	--	--
Euphorbia heterophylla	1(2)	5(1)	--	--
Foeniculum vulgare	1(1)	0(1)	--	--
Satureja hortensis	4(1)	5(1)	--	--

Assessment of several herbicides for use in flax. Sexsmith, J.J. Redwood flax was seeded on dry land at Lethbridge, Alberta, on May 22, 1961. Quadruplicate plots were treated on June 15 with the following materials in a solution volume of 13.1 gpa: butyl ester of 2,4-D at 4, 6, and 8 oz/A; dimethylamine salt of 2-methoxy-3,6-dichlorobenzoic acid (Banvel D) at 4, 8, and 12 oz/A; potassium salt of 2-(MCPP) at 12, 18, and 24 oz/A; N-(3,4-dichlorophenyl)methacrylamide (Dicryl, N-4556) at 2, 3, and 4 lb/A; and butyl ester of 4-(2,4-DB), a 15:1 mixture of sodium salts of 4-(MCPB) and MCPA (Tropotox Plus), a 50/30 mixture of amyl ester of 2,4,5-T and butyl ester of MCPA (Celatox), and dimethylamine salt of 2-methoxy-3,5,6-trichlorobenzoic acid (Banvel T), all at 8, 12, and 16 oz/A. At time of treatment flax was 2 to 4½ in. tall (10 to 20 leaves), Russian thistle from "pine-leaf" to 4-branch stage (3½ in. tall), and red-root pigweed from late seedling to 3 in. tall. The infestation was considered as medium heavy. Weed control and flax injury estimates were taken early in August, and height measurements of thistles and flax were taken a few days before plot harvest started on August 25. Yield samples were obtained from 4 rod rows in each 8- by 20-ft. plot. (Table on next page.) (Contributed by Canada Agriculture, Research Station, Lethbridge, Alberta.)

Herbicide	Russian thistle control[1]	Red-root pigweed control[1]	Rated flax injury[2]	Flax yield[3]
2,4-D	****	**	****	****
Banvel D	***	*****	***	***
2-(MCPP)	*	*	*****	**
Dicryl	-	-	****	*
4-(2,4-DB)	****	***	**	****
Tropotox Plus	-	-	*****	**
Celatox	*	*	-	-
Banvel T	***	****	*	**

1. - nil; ***** excellent. 2. - severe; ***** nil.
3. - seriously reduced; ***** equal hand-weeded check.
(Based on effects at medium and high rates.)

<u>Effects on Russian thistle-infested flax of the butyl ester of 2,4-D formulated at different acid equivalent contents</u>. Sexsmith, J.J. Redwood flax was seeded on dry land at Lethbridge on May 22, 1961. Herbicide treatments were applied in a 6-replicate, split-plot test on June 16, using a solution rate of 13.1 gpa. Five butyl esters of 2,4-D were applied at rates of 0, 4, 6, and 8 oz/A. Four esters, prepared by Amchem Products and having acid equivalents of 32, 64, 96, and 128 oz/Imperial gal., were compared with a commercially available 80-oz. ester (Green Cross Products). At time of treatment the flax was from 1½ to 3½ in. tall, and the light medium infestation of Russian thistle was from "pine-leaf" to first branching, up to 3 in. tall. Weed control and crop injury ratings and height measurements of the weeds and crop were taken on August 11. Yield samples were obtained from 4 rod rows per plot, harvest starting on August 24. Results: Differences in effect of the three treatment rates were found for all of the materials, but no significant difference between materials of the various acid contents was evident for any of the assessments made on the weed or the crop. (Contributed by Canada Agriculture, Research Station, Lethbridge, Alberta.)

<u>Comparison of selected acetic and butyric herbicides for weed control in peas</u>. Sexsmith, J.J. On May 19, 1961, Dark Skin Perfection peas were seeded into a silty clay loam irrigated soil at Lethbridge. The following herbicides were applied on June 21 at a solution rate of 22 gpa: mixed amines of 2,4-D and diethanolamine of MCPA at 4, 6, and 8 oz/A, and the sodium salt of 4-(MCPB(and a 15:1 mixture of the sodium salts of 4-(MCPB) and MCPA (Tropotox Plus) at 12, 16, and 24 oz/A. The naturally occurring, light weed infestation consisted of redroot pigweed with a few lambsquarters. At time of treatment the peas were in the 3- to 4-joint stage up to 6 in. tall, and the redroot pigweed and lambsquarters in late seedling to stemming stage up to 3 in. tall. Visual ratings of weed control and crop injury were made on July 28. Because of the poor and non-uniform stand, no measure of the effects on green pea yield was obtained. (Table on next page.) (Based on effects of high treatment rate.) The butyric-acetic mixture gave better weed control than the butyric material while causing only slightly more visible injury to the pea crop. (Contributed by Canada Agriculture, Research Station, Lethbridge, Alberta.)

	Redroot pigweed control[1]	Lambs-quarters control[1]	Rated pea injury[2]
2,4-D	***	*****	**
MCPA	**	***	**
4-(MCPB)	**	****	****
Tropotox Plus	***	*****	***

1. - nil; ***** excellent. 2. - severe; ***** nil

<u>Preplanting and postemergence control of wild oats and other annual weeds in processing peas</u>. Sexsmith, J.J. Preplanting treatments to 8- by 22-ft. quadruplicate plot areas were applied on May 15, 1961, on a silty clay loam irrigated soil and disked in to a depth of approximately 2 in. on the same day. Treatments included 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) at 1, 1½, and 2 lb/A, and EPTC and trietazine each at 2, 3, and 4 lb/A. Dark Skin Perfection peas were seeded on May 18, and postemergence treatments with barban (Carbyne) at 6, 8, and 12 oz/A were applied on June 8 when wild oats were in the 2- to 3-leaf stage. Weed infestation on check plots consisted of wild oats (approx. 45/sq. yd.), a medium infestation of green foxtail, and a light infestation of broadleaf annuals which was mainly redroot pigweed with a few lambsquarters. Control estimates and injury ratings were made on June 22. Pea stands were thin and uneven, and yield data were not obtained.

	Avadex			EPTC			trietazine		
Rate - lb/A	1	1½	2	2	3	4	2	3	4
Wild oat control - %	82	90	95	96	99	99	74	82	92
Green foxtail control-%	62	77	86	96	99	99	66	75	88
Broadleaf control - %	0	0	0	77	81	86	79	81	90
Pea injury - 0-5	1.5	1.5	2.0	1.0	1.0	1.5	0.5	0.5	1.0

Growth suppression and kill of wild oats was classed as fair to good from the 12-oz. treatment of barban but poor from the other rates. None of the barban treatments gave control of green foxtail or broadleaf annuals nor caused any injury to the peas. Crop injury from preplanting treatments was difficult to assess because of the poor stand, but was evidenced by a rather severe curling of young plants and some delay from Avadex, slight stunting and delay from EPTC, and some yellowing of foliage from trietazine. (Contributed by Canada Agriculture, Research Station, Lethbridge, Alberta.)

<u>Wild oat control in sugar beets</u>. Sexsmith, J.J. Preplanting treatments to 8- by 22-ft. quadruplicate plot areas were applied on May 9, 1961, on a silty clay loam irrigated soil and immediately disked in to a depth of approximately 2 in. Wild oats had been seeded into the plot area the previous day, the seeding resulting in a relatively light infestation that averaged 43 plants/sq. yd. Preplanting treatments consisted of IPC at 4, 5, and 6 lb/A; 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex) at 1½, 1 3/4, and 3 lb/A; and EPTC at 2, 3, and 4 lb/A. The sugar beets were seeded on May 9, and on

June 1, when the wild oats were in the 2- to $2\frac{1}{2}$-leaf stage, barban (Carbyne) treatments were applied at rates of 6, 8, and 12 oz/A. Wild oat control' estimates were made on June 16, and on June 20 the thinning and weeding operation was timed. A very light infestation of redroot pigweed was present on the plot area. Beets were harvested on September 27.

	IPC			Avadex			EPTC		
Rate - lb/A	4	5	6	$1\frac{1}{2}$	1 3/4	2	2	3	4
Wild oat control -	82	88	92	88	90	91	94	95	98
Weeding and thinning time- % saving	12	13	15	16	18	22	19	22	33

A stand reduction of the seedling beets of approximately 15% to 25% resulted from the 2-lb. rate of Avadex. EPTC treatments gave fairly good control of redroot pigweed. Growth suppression and kill of wild oats was farily good as a result of the 12-oz. barban treatment but poor from the 6- and 8-oz. rates. No saving of time for thinning and weeding was effected by any of the barban treatments. No significant yield differences were obtained. (Contributed by Canada Agriculture, Research Station, Lethbridge, Alberta.)

HORTICULTURAL CROPS

Pre-emergence weed control in strawberries in Michigan, 1961 Bell, H. K. and Ries, S. K. Two varieties of strawberries, Robinson and Tennessee Beauty were planted on May 15 in sandy loam soil at East Lansing. On June 29, the following herbicides were applied either as sprays or granular materials as designated (G=granular; S=spray): 8 lb/A N-N-dimethyl-2,2-diphenyacetamide (Diphenamid)(S), 4 lb/A N-(3-chloro-4-methylphenyl)-2-methylpentanamide(Solan) (S), 4 lb/A Propyl ethyl-n-butylthiolcarbamate (Tillam)(S), 8 lb/A Tillam (S), 1 lb/A trietazine (S), 1 lb/A trietazine (G), 1 lb/A Dupont 326 (3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea) (S), 1 lb/A Propazine (S), 4 lb/A Zytron (G), 8 lb/A 2,4-DEP (S), and 8 lb/A 2,4-DEP (G). Plots were 4' x 10', replicated four times. Sprays were applied at 25 psi in 27 gpa of water. Temperature was 62°F on date of application. Plots were irrigated with ½" of water the day after treatments were applied. A ½" of rain fell on July 2 and there was no further significant rainfall until July 16 when ½" fell. Weed control and injury ratings were made on July 17 and again on August 12. The dominant weeds present in check plots at time of final evaluation were as follows, listed in order of estimated population: *Digitaria sanguinalis*, *Setaria sp*, *Stellaria media*, *Amaranthus retroflexus*, *Portulaca oleracea*, and *Chenopodium album*. The materials which gave commercial control or better were as follows: Diphenamid (S) 8 lb/A, Tillam (S) 8 lb/A, Dupont 326 (S) 1 lb/A, 2,4-DEP (S) 8 lb/A, 2,4-DEP (G) 8 lb/A, and propazine (S) 1 lb/A. Of these, Diphenamid was the only material which resulted in no injury to the crop plants. Tillam, Zytron, and both forms of 2,4-DEP caused mild injury and Dupont 326 caused severe injury. (Michigan Agricultural Experiment Station, East Lansing).

Pre-emergence herbicides for crabgrass control in turf. Davis, R. R. The herbicides dimethyl 2,3,5,6-tetrachloroterephthalate (Dacthal), N,N-di-n-propyl-2,6-dinitro-4-trifluoromethylaniline (Trifluralin), N,N-di-n-propyl-2,6-dinitro-4-methylaniline (Dipropalin), O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron), diphenylacetonitrile (Diphenatrile), mixed isomers of polychlorodicyclopentadiene, calcium arsenate, chlordane, and calcium propyl arsonate, were applied to a sod of common Kentucky bluegrass April 4, 1961. All treatments except the Zytron emulsion were applied with a spreader. The spray treatment was at the rate of 100 gpa at 25 psi. There were 4 replications of each treatment in 100 sq. ft. plots. (Department of Agronomy, Ohio Agricultural Experiment Station, Wooster).

Herbicide	Rate of formulation per 1000 sq ft	Crabgrass plants per 10 sq ft 7-11-61	Percent of sod covered by crabgrass 10-3-61
Dacthal	10 lb 2.35% granular	0	0
Trifluralin	5 lb 2% granular	1	0
Calcium arsenate	18 lb 48% granular	1	2
Dipropalin	5 lb 2% granular	1	2
Zytron	8 lb 4.4% granular	2	2
Zytron	1 pt 3 lb/gal emulsion	1	4
Polychlorodicyclopentadiene isomers	6 lb 7.5% granular	5	8
Chlordane	40 lb 5% granular	11	9
Diphenatrile	10 lb 5.85% granular	3	19
Calcium propyl arsonate	5 lb 20% granular	138	49
No treatment	-----	122	57
LSD 5%		12	28

Chemical weed control in carrots grown in Knik silt loam soil, 1961. Dinkel, D. H. PREEMERGENCE. Royal Chantenay carrots seeded 1/2" deep in Knik silt loam soil on May 12 at Palmer, Alaska, were sprayed May 22 with the following herbicides (rates, lb/A): Three and 6 N-(3,4-dichlorophenyl)methacrylamide (Dicryl), 3 and 6 N-3-chloro-4-methylphenyl)-2-methylpentanamide (Solan), 3 and 6 N-(3,4-dichlorophenyl)-2-methylpentanamide (Karsil), 1 and 2 ipazine, 1 and 2 propazine, 5 and 10 O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron), 6 amiben, 6 amiben granular, 6 Dicryl + 5 CIPC, and 5 Zytron + 3 Dicryl. Herbicides were applied to plots 1.5' by 18' in each of five replicates at 30 psi pressure in 40 gpa of water. The air temperature at the time of herbicide application was 60°F, the soil surface was dry and only .08" rainfall was recorded during the next 3 weeks. The average maximum air temperature during the week following application was 62°F. Weeds consisting of Chenopodium album, Spergula arvensis, Thlaspi arvense, Stellaria media, Capsella bursa-pastoris, Brassica kaber and a few other miscellaneous broadleaved weeds were emerging at the time of herbicide application. Two lb ipazine, 6 lb Dicryl + 5 lb CIPC and 6 lb Karsil gave 100 percent weed control for more than 6 weeks following application without injury to carrots. Two lb propazine and 6 lb amiben gave 100 percent weed control but a slight early stunting of carrots was noted. Six lb Dicryl, 6 lb Solan, 1 lb ipazine and 1 lb propazine gave commercially satisfactory weed control. No

treatment significantly reduced the yields of carrots compared to the untreated plots. POSTEMERGENCE. Postemergence herbicide treatments were applied to plots located adjacent to and similar in design to the preemergence trial planted the same day. Plots were sprayed June 14 when carrots were 2" tall with the following herbicides (rates, lb/A): 3 and 6 Dicryl, 3 and 6 Solan, 3 and 6 Karsil, 1 and 2 ipazine, 10 Zytron, 6 Dicryl + 5 CIPC, 6 Dicryl + Zytron, 3 Solan + 6 amiben, 3 Solan + 3 Dicryl and 120 gpa Stoddard Solvent. The air temperature at the time of herbicide application was 74°F, the soil surface was moist and 1" of rainfall was recorded during the week following application. The average maximum air temperature during the week following application was 69°F. All treatments except 10 lb Zytron gave 100 percent weed control for more than 6 weeks following herbicide application. Two lb ipazine, 6 lb Dicryl, 6 lb Dicryl + 5 lb Zytron and 6 lb Dicryl + 5 lb CIPC caused slight stunting of carrots but no herbicide significantly reduced the yields of carrots. (Contribution from The Alaska Agric. Exp. Sta., Palmer).

Posttransplanting weed control in celery grown in Knik silt loam soil, 1961. Dinkel, D. H. Utah Jumbo and Spartan No. 162 celery plants transplanted in Knik silt loam soil on May 29 at Palmer, Alaska, were sprayed June 19 with the following herbicides (rates, lb/A): 4 N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solan), 4 N-(3,4-dichlorophenyl)methacrylamide (Dicryl), 5 CIPC, 6 CDEC and 4 propazine. Herbicides were applied to plots 1.5' by 15' in each of 3 replicates of each variety at 30 psi pressure in 40 gpa of water. The air temperature at the time of herbicide application was 79°F and soil surface was dry. Rain of .12" 3 hours following application, .27" June 20, .27" June 21, .26" June 22 and .51" June 23 occurred during the next 2 weeks. The average maximum air temperature for the week following application was 64°F. Celery plants were beginning to recover from transplanting at the time of herbicide application. Check plots were handweeded when the weeds were approximately 2" tall and all treatments were kept free from weeds the remainder of the season. Weeds were primarily *Chenopodium album*, *Spergula arvensis*, *Thlaspi arvense*, *Stellaria media*, *Capsella bursa-pastoris*, *Brassica arvensis* and a few other miscellaneous broadleaved weeds. Treatments of 4 lb Solan and 4 lb propazine gave 100 percent weed control for the season and approximately double the yields of the check plots were recorded. Increased yields were probably due to the reduction of weed competition in treated plots. Four lb Dicryl controlled all weeds except *Stellaria media* without injury to celery. All other herbicides, while not injurious to celery, gave commercially unsatisfactory weed control. No differences in response to herbicides were noted for the two varieties. (Contribution from The Alaska Agricultural Experiment Station, Palmer.)

Chemical weed control in parsnips grown in Knik silt loam soil, 1961. Dinkel, D. H. Variety Round parsnips from Denmark seeded 1/2" deep in Knik silt loam soil on May 12 at Palmer, Alaska, were sprayed May 22, preemergence, with 6 lb/A N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solan) and 6 lb/A N-(3,4-dichlorophenyl)methacrylamide (Dicryl) and sprayed postemergence June 14 with 4 lb/A Solan and 4 lb/A Dicryl. Herbicides were applied to plots 1.5' by 18' in each of five replicates at 30 psi pressure in 40 gpa of water. The air temperature at the time of preemergence application was 60°F, the soil surface was dry and only .08" rainfall was recorded during the next 3 weeks. The average maximum air temperature during the week following preemergence application was 62°F. The air temperature at the time of postemergence application was 74°F, the soil surface moist and 1" of rainfall was recorded during the week following application. The average maximum air temperature during the week following postemergence application was 69°F. Weeds were primarily *Chenopodium album*,

Spergula arvensis, Thlaspi arvense, Stellaria media, Capsella bursa-pastoris, Brassica kaber and a few other miscellaneous broadleaved weeds. Preemergence treatments of 6 lb Solan and 6 lb Dicryl gave 100 percent weed control for more than 4 weeks following application. Postemergence treatments of 4 lb Solan and 4 lb Dicryl gave 100 percent weed control for the remainder of the season following application. No treatment injured parsnips significantly. (Contribution from the Alaska Agricultural Experiment Station, Palmer.)

Chemical weed control in strawberries and raspberries grown in Knik silt loam soil in Alaska, 1961. Dinkel, D. H. STRAWBERRIES. A second year planting of Sitka hybrid strawberries was treated preemergence May 5, with 4 lb/A trietazine and 2 lb/A simazine (granular and spray). Postemergence treatments of 2 lb/A trietazine, 4 lb/A N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solan) and 2 lb/A simazine (granular) were applied June 19. Herbicides were applied to plots 1.5' by 18' in each of 5 replicates at 30 psi in 40 gpa of water. The air temperature at the time of preemergence application was 63°F, the soil surface was moist and no rainfall was recorded during the week following application. The air temperature at the time of postemergence application was 79°F, the soil surface was dry and approximately 1" of rainfall was recorded during the week following application. The average maximum air temperature during the week following application was 63°F for preemergence and 64°F for postemergence. Weeds were primarily Descurainia sophia, Capsella bursa-pastoris, Stellaria media, Brassica kaber and a few other miscellaneous broadleaved weeds. Four lb Solan gave 80 percent weed control until early in September when a few Stellaria media and Descurainia sophia began to appear. Four lb trietazine gave almost 100 percent weed control for the entire season when applied preemergence but 2 lb trietazine applied postemergence resulted in only 50 percent weed control. Trietazine was not effective against established weeds. Two lb simazine spray gave almost 100 percent weed control and the granular formulation gave between 25 and 50 percent weed control. Four lb Solan and 2 lb trietazine, postemergence application, resulted in slight temporary injury to strawberry foliage. Two lb simazine, spray, preemergence, produced a slight stunting and injury of foliage which became apparent later in the season. RASPBERRIES. Four lb/A trietazine and 2 lb/A simazine were applied May 5 to a randomized planting of several varieties of raspberries prior to the resumption of raspberry growth in the spring. Six lb/A Solan, 2 lb/A trietazine and 2 lb/A simazine were applied June 19 as a basal spray after raspberry growth had begun. Five replicates of the treatments were randomized on the previously randomized variety test of raspberries without being influenced by the previous randomization of the variety test. The experimental plots were adjacent to and similar in size and design to those of the strawberry experiment. The date and method of application and predominant weed species were the same as those for strawberries. All treatments gave season long weed control without apparent injury to the raspberries. (Contribution from The Alaska Agricultural Experiment Station, Palmer.)

Split applications of Solan for the control of weeds in transplanted tomatoes. Haltvick, E. T. and G. G. Weis. Weekly applications of 1 lb/A of N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solar) beginning two weeks after transplanting and continuing for four weeks gave excellent control of weeds in transplanted Campbell 146 tomatoes at Arlington, Wisconsin. The plots were free of weeds throughout the entire harvest season, and no mechanical or hand weeding was necessary. Two applications of 2 lb/A of Solan beginning two weeks after transplanting did not effectively control the weeds; nor did the recommended rate of 4 lb/A applied two weeks after transplanting. The yield of marketable tomatoes was highest in the 1 lb/A rate, followed by check-weeded, 2 lb/A, and 4 lb/A plots

respectively. No evidence of injury to the tomato plants or fruit was observed in any of the treatments. (Department of Horticulture, University of Wisconsin. Madison, Wisconsin).

Preemergence control of crabgrass. Hemphill, D. D. Several herbicides were applied during the period, March 30 to April 15, 1961 for the preemergence control of crabgrass. Calcium arsenate, chlordane, dimethyl 2,3,5,6-tetrachloroterephthalate (Dacthal) and O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron) were applied to the same plots as in 1959 and 1960. Calcium propyl arsonate, polychlorodicyclopentadiene isomers (Bandane), N,N-di-n-propyl-2,6-dinitro-4-methylaniline (Dipropalin), N,N-di-n-propyl-2,6-dinitro-4-trifluoromethylaniline (Trifluralin), and N,N-dimethyl-2,2-diphenylacetamide (Diphenamid) were applied to plots not previously treated with these particular chemicals. Diphenamid 4 lb/A and Trifluralin 4 lb/A thinned bluegrass turf. Dipropalin 4 lb/A gave satisfactory crabgrass control without visible turf injury. Bandane at rates lower than 30 lb/A did not give satisfactory control. Calcium arsenate 18 lb/1000 sq ft injured bluegrass turf under drought conditions. Calcium propyl arsonate was promising but not as effective as Dacthal or Zytron. (Contribution from the Department of Horticulture, Missouri Agricultural Experiment Station, Columbia.)

Preformance of preemergence herbicides in green beans. Hemphill, D. D. Several herbicides were evaluated for preemergence use in green beans, var. Topcrop. EPTC, CDEC and CDAA have given satisfactory results in previous years and were used as standards of comparison for new herbicides. Dimethyl 2,3,5,6-tetrachloroterephthalate (Dacthal) 8 lb/A appeared promising. N,N-di-n-propyl-2,6-dinitro-4-trifluoromethylaniline (Trifluralin) 8 lb/A and N,N-dimethyl-2,2-diphenylacetamide (Diphenamid) 8 lb/A caused stunting and reduced yields. Lower rates should be evaluated because weeds were eliminated by this rate. 2,6-Dichloroben-zonitrile (Casoron) 3 lb/A did give satisfactory weed control. Granular DNBP (Preemerge) 7.5 lb/A appears promising. (Contribution from the Department of Horticulture, Missouri Agricultural Experiment Station, Columbia.)

Effects of herbicides on growth and fruiting of strawberries. Hemphill, D.D. Tris (2x4-dichlorophenoxyethyl) phosphite (2,4-DEP)(Falone) 6 lb/A, sesone 4 lb/A, dimethyl 2,3,5,6-tetrachloroterephthalate (Dacthal) 8 lb/A and 2,5-dichloro-3-nitrobenzoic acid (Dinoben) 4 lb/A were applied as sprays to a new planting of strawberries, var. Surecrop, on August 9, 1960. A second application using the same rates was made in early April, 1961 just as new growth began. Granular formulations of Dacthal, Falone and Dinoben were used in the April application. The August application of Dinoben resulted in leaf chlorosis and burn and reduced final plant stand. All herbicides gave satisfactory late summer and fall weed control. The April application gave satisfactory control of annual grasses and broadleaved weeds through the harvest season. Plants treated with Falone exhibited leaf modification after the April application. Treatments were replicated three times. Average yields in quarts per plot were as follows: Control - 68.3, Falone - 68.0, Sesone - 75.3, Dacthal - 76.8 and Dinoben 63.7. (Contribution from the Department of Horticulture, Missouri Agricultural Experiment Station, Columbia.)

Posttransplanting weed control treatments in cabbage. Herron, J. W. and Cotter, D. J. Marion market cabbage was transplanted into Maury silt loam soil on May 2, 1961. Of the herbicides tested, 2,6-dichlorobenzonitrile (Casoron), tert-butyl-di-n-propylthiolcarbamate, Stauffer 1856 ethyl-di-n-butylthiolcarbamate,

Stauffer 1870, O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothicate (Zytron amiben, N,N-dimethyl-2,2-diphenylacetamide (Diphenamid), and propyl ethyl-n-butylthiolcarbamate (Tillam) gave the most promising results. Data for these treatments are presented in the following table:

Treatment	Rate lb/A	Injury rating	Weed counts sq ft B.	G.	Yield, oz/plot 1st harvest	Total
Casoron	4	0.6	8	26	350	597
Casoron	6	0.4	11	23	405	560
1856 (inc)	5	0.4	12	29	357	527
1856 (inc)	10	0.0	11	35	312	470
1870 (inc)	4	0.0	12	18	438	588
1870 (inc)	6	0.2	12	10	289	494
Zytron G	15	0.0	4	10	301	488
Zytron G	20	0.0	7	5	376	601
Amiben G	4	0.8	3	2	269	534
Amiben G	6	3.0	1	tr	168	390
Diphenamid	4	0.2	9	1	326	491
Diphenamid	6	0.0	6	6	445	617
Dacthal	8	0.8	9	6	384	543
Dacthal	12	0.2	7	6	286	512
Tillam G(inc)	4	0.0	7	47	386	564
Tillam G(inc)	6	1.2	5	17	394	585
Check		0.0	41	57	162	416
LSD .05		.78	7.8	19.7	115	92
.01		1.04	10.1	26.2	150	123

Injury 0 = no injury, 5 = kill; weed ratings 0 = no weeds, 3= commercial control, 5 = heavy infestation. Banvel-T caused severe injury to the crop and CDEC did not give satisfactory weed control. (Contribution from the Department of Horticulture, Kentucky Agricultural Experiment Station, Lexington.)

Testing of 27 herbicides on 16 vegetable crops and sugar beets on mineral soil. Miller, R. Alden. Crops were seeded in 3 replicated 24 feet rows 36 inches apart. Herbicides were applied by an experimental sprayer or a Gandy granular unit. Cool season crops were seeded April 4 and treated April 5. The soil was moist and 42°F the day of treatment. Precipitation one month after treatment totaled 2.25 inches. Warm season crops were planted May 19 and treated May 22. Precipitation one month following treatment totaled 4.85 inches. Injury and weeding ratings were made numerically by visual observations. Three highest ranking treatments were rated upon time to weed the row, grass and broadleaf weed count and weights, and yield records. The results given below list the crop, followed by the 1st, 2nd and 3rd choice of herbicides giving rate active per acre and form. L indicates liquid and G granulars. Peas, N,N-dimethyl-2,2-diphenylacetamide (Diphenamid) 8 L, N,N-di-n-propyl-2,6-dinitro-4-trifluoromethylaniline (Trifluralin) 6 L, 2-allylamino-4-chloro-6-isopropylamino-s-triazine (G-34361) 2 L; onions, dimethyl 2,3,5,6-tetrachloroterephthalate (Dacthal) 8 L, CIPC 4 plus 2-chloro-N,N-diallylacetamide(Randox) 2 L, Randox 4 plus CIPC 2 L; cabbage direct-seeded(D.S.), Trifluralin 4 L, monooleyl amine salt of endothal(TD-266) 4 L, Dacthal 12 L; cabbage transplanted, Dacthal 24 L, endothal 5 L, Diphenamid 8 L; sugar beets, endothal 5 L, endothal 5 G, EPTC 3 L; carrots, amiben 4 L, CIPC 8 L, CIPC 8 G; Irish potato, G-34361 2 L, Diphenamid 8 L, Dacthal 8 L; sweet corn, simazine 3 L, atrazine 3 G, atrazine 3 L; snap beans, amiben 4 L, Trifluralin 6 L,

Dacthal 8 L; lima beans, Trifluralin 6 L, Dacthal 12 L, CIPC 4 G; tomatoes D. S., 2-benzylmercapto-4,6-dimethylpyrimidine (R-3400) 8 L, Diphenamid 8 L, N-(3-chloro-4-methylphenyl)-2-methylpentanamide(Solan) 4 L; tomatoes transplanted, amiben 4 G Casoron 4 L, simazine 3 G; squash in general, amiben 4 L, amiben 6 L, amiben 4 G; muskmelon, NPA, sodium salt(Alanap3) 6 L, Diphenamid 6 L, amiben 4 G; cucumbers, amiben 4 L, amiben 4 G and Diphenamid 6 L. University of Illinois, Drug and Horticultural Experiment Station, Downers Grove.

Post-emergence weed control on tomatoes, 1961 Ries, S.K. and Donnalley, W.F. Four post-emergence tests were made on tomatoes planted on sandy-loam soils, one direct seeding on May 16 and two transplantings June 1, June 1, at East Lansing and one transplanting on May 27 at Sodus. The treatment dates were June 15, June 15, June 26 and June 21, respectively. The varieties used were Libby C-52, Cornell 54-149, Cornell 54-149 and Cornell 54-149 respectively. The following herbicides were applied in one or more of the tests: 2 and 4 lb/A N-(3-chloro-4-methylphenyl)-2-pentanamide (Solan), 4 lb/A 2,6-dichlorobenzonitrile (Casoron), 4 lb/A amiben granular, 5 lb/A CDAA granular, 5 lb/A CDAA-T (CDAA plus trichlorobenzyl chloride) granular, 7 lb/A CIPC granular, and 4 and 8 lb/A of propyl ethyl-n-butylthiolcarbamate (Tillam), which was raked in after application. In all 4 tests 4 lb/A Solan spray, and 5 lb/A CDAA granular gave commercially good weed control without causing any visible injury or a reduction in yield. In 3 of the 4 tests 4 lb/A amiben granular gave commercial weed control, and did not cause injury or reduce the yield in any test. 4 lb/A of Casoron and CIPC reduced the yield in the three tests where they were included. CDAA-T also reduced the yield in one test. Tillam at both the 4 and 8 lb/A rate gave excellent weed control without causing injury where used. The dominant weed species were *Digitaria sanguinalis*, *Amaranthus retroflexus*, *Chenopodium album*, and *Portulaca oleracea*. (Contribution from Michigan Agricultural Experiment Station).

Lay-by weed control in muckland onions, 1961. Nelson, D. C. and R. E. Nylund. Trapp's Downing Yellow Globe onions seeded in muck soil on May 4 were cultivated and hand-weeded as necessary to control weeds until July 20 when the following herbicides were applied shortly after the final cultivation: 11 and 22 lb/A Randox T (29% CDAA plus 71% trichlorobenzyl chloride), 8 lb/A CIPC, 1 and 2 lb/A diuron, 5 and 10 lb/A EXD (Herbisan), 1 and 2 lb/A diquat, and 2 and 4 lb/A 2,6-dichlorobenzonitrile (Casoron). These were applied as basal sprays at 25 psi pressure in 60 gal. water per acre to quadruplicated plots 4' x 22'. At the time of application no weeds were present, onions were at the 7-8 leaf stage, the soil surface was dry, temperature 75°F., and humidity 50%. Rainfall during the first two weeks following spraying occurred on July 21 (0.32"), July 23 (1.30"), July 30 (0.85"), July 31 (3.25"), and August 3 (0.54"). Weed control was rated on August 11 at which time weeds in the control plots consisted of 50% *Portulaca oleracea*, 40% *Amaranthus retroflexus*, and 10% *Chenopodium album*. Onion stands and yields were recorded at harvest on September 21. None of the herbicides reduced onion stands or yields. Weed control varied from none or practically none with diquat and EXD to excellent with both rates of Randox T, diuron, and Casoron. CIPC gave only moderately good weed control. (Paper No. 4730 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station).

Early postemergence weed control in muckland onions, 1961. Nelson, D. C., and R. E. Nylund. Trapp's Downing Yellow Globe onions were seeded in muck soil on May 4. When they were at the loop to early flag stage, on May 31, the following herbicides were applied both as liquid and granulars: 6 lb/A CDAA, 11 and 22 lb/A Randox T (29% CDAA plus 71% trichlorobenzyl chloride) and 8 lb/A CIPC. In addition, 3 lb/A amiben and 5 and 10 lb/A O-(2,4-dichlorophenyl) O-methyl

isopropylphosphoramidothioate (Zytron) were applied as granular materials. Liquid herbicides were applied at 25 psi pressure in 60 gpa water. Plots were 4' x 22", replicated four times. On the date of application the soil surface was moist, temperature 75°F., humidity 70%, and weeds were in the cotyledon to two-leaf stages. Rainfall during the two weeks following application was: June 5 (0.26"), June 7 (0.05"), and June 12 (0.67"). Weed control was rated on June 19 and plots were harvested on September 21. Weed populations in the control plots consisted of 60% Chenopodium album, 15% Amaranthus spp., 15% Portulaca oleracea, and 10% Polygonum spp. Comparing liquids and granulars, CDAA and Randox T at 22 lb were equally as effective in both forms, but the 11 lb rate of Randox T was more effective in a granular form, and CIPC was more effective in liquid form. The only herbicides which gave more than 50% weed control were 6 lb CDAA, 11 lb Randox T (granular), 22 lb Randox T, and 8 lb CIPC (liquid). None of the herbicides tested reduced stands or yields of onions in 1961. (Paper No. 4731 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station).

Depth of seeding and herbicide formulation in relation to preemergence weed control in muckland onions, 1961. Nelson, D. C. and R. E. Nylund. On May 4 Trapp's Downing Yellow Globe onions were seeded ½", 1", and 1½" deep on muck soil. The following herbicides were applied on May 8 both as liquids and as granular materials: 6 lb/A CDAA, 11 and 22 lb/A Randox T (29% CDAA plus 71% trichlorobenzyl chloride), and 8 lb/A CIPC, In addition, the following liquid herbicides were applied: 5 and 10 lb/A)-(2,4 dichlorophenyl) O-methyl isopropylphosphoramidothioate (Zytron) and a mixture of 4 lb CIPC and 3 lb CDAA. All herbicides were applied to plots 4' x 22' replicated four times. Liquids were applied at 25 psi pressure in 60 gpa water. On the date of application the temperature was 54°F, the soil surface wet, and no weeds or onions had emerged. Rain during the first two weeks following application fell only on May 17 (1.61"). Weed control and onion injury were rated on May 31; plots were harvested on September 21. Weed populations in control plots consisted of 70% Chenopodium album, 20% Amaranthus spp., and 10% Polygonum spp. Onion stands in plots seeded at 1" and 1½" depths were 83% and 85%, respectively, of stands in the plots seeded at ½". Likewise onion yields from the 1" and 1½" depths of seeding were 88% and 89%, respectively, of the yields from the ½" depth of seeding. None of the herbicides caused any measurable degree of onion injury nor did they reduce yields or stands of onions at any of the three seeding depths. In contrast to results obtained with the same herbicides in 1960, the granular forms of CIPC, CDAA, and Randox T gave somewhat better weed control in 1961 than the liquid forms. Only 11 lb/A Randox T, liquid, 11 and 22 lb/A Randox T, granular, and 10 lb/A Zytron gave satisfactory weed control. (Paper No. 4732 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Variable dosage sprayer application of preemergence herbicides on four vegetable crops on muck soil, 1961. Nylund, R. E., and D. C. Nelson. King Red beets, Danish Ballhead cabbage, Nantes carrots, and Downing Yellow Globe onions seeded May 10 on muck soil having a pH of 6.2 were sprayed on May 19 with the following herbicides: 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (DuPone 326); N,N-dimethyl-2,2-diphenylacetamide (Diphenamid); endothal, dioleylamine salt (Pennsalt TD 66); CDAA; amiben; 2,4-bis(isopropylamino-6-methylmercapto-s-triazine (Prometryne); 2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine (Atrametryne); and 2-chloro-4-ethylamino-6-(3-methoxypropylamino)-s-triazine (G-34696). All herbicides were applied with a variable dosage sprayer at 30 psi pressure in 74 gpa water to duplicated plots. Each plot consisted of four 110' rows (single rows of each crop) seeded 12" apart. Every third plot was an untreated control. At the time of spraying all crops had germinated but only beets

were beginning to emerge. Only a few weeds (Capsella bursa-pastoris) had emerged. The soil was wet at the time of spraying, but the only rainfall during the first two weeks following spraying occurred on May 24 (0.11") and May 31 (0.50"). Temperature at the time of spraying was 50°F. and humidity 70%. During the two weeks following spraying temperatures varied from 36°F. to 86°F. and averaged 61°F. Weed control and crop injury ratings were recorded 18 and 38 days after herbicide application. Weeds in the control plots consisted of Capsella bursa-pastoris, Amaranthus retroflexus, Setaria spp. and Echinochloa crusgalli. The following gives the herbicides which showed promising selectivity (the lower figure, the minimum acre rate which gave satisfactory weed control; the higher figure, the maximum rate which gave no crop injury). For onions: 6-10 lb Diphenamid, 4-8 lb Pennsalt TD 66, 2-5 lb CDAA, 2-5 lb amiben, and 2-4 lb G-34696. For carrots: 2-5 lb DuPont 326, 6-8 lb Diphenamid, 2-5 lb amiben, and 0.1-1 lb Prometryne. For cabbage: 6-10 lb Diphenamid, 1-4 lb CDAA, and 2-5 lb amiben. For beets: 6-8 lb Diphenamid, and 5-8 lb Pennsalt TD 66. Atrametryne injured all crops at the lowest rate measurable. (Paper No. 4724 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station.)

Variable dosage sprayer test of postemergence herbicides in four vegetable crops on muck soil, 1961. Nylund, R. E., and D. C. Nelson. King Red beets, Danish Ballhead cabbage, Nantes carrots, and Downing Yellow Globe onions seeded May 10 in muck soil were sprayed on May 29 with the following herbicides: 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (DuPont 326); N,N-dimethyl-2,2-diphenylacetamide (Diphenamid); endothal, di-N,N-dimethyl cocoamine salt (Pennsalt TD 47); CIPC; 2,4-bis(isopropylamino)-6-methylmercapto-s-triazine (Prometryne); 2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine (Atrametryne); and 2-chloro-4-ethylamino-6-(3-methoxypropylamino)-s-triazine (G-34696). All herbicides were applied with a variable dosage sprayer at 30 psi pressure in 74 gpa water to duplicated plots. Each plot consisted of four 110' rows (single rows of each crop) seeded 12" apart. Every third plot was an untreated control. At the time of spraying beets and cabbage were at the early one-leaf stage, carrots at the cotyledon to early one-leaf, and onions at the loop to flag stage. Weeds, principally Capsella bursa-pastoris, Amaranthus retroflexus, Setaria spp., and Echinochloa crusgalli, were at the cotyledon to early two-leaf stages. The soil was wet at the time of spraying and rainfall during the two weeks following spraying occurred on May 31 (0.50"), June 7 (0.13"), June 8 (0.06"), and June 10 (0.51"). Temperature at the time of spraying was 60°F. and humidity was 40%. During the first two weeks following spraying temperatures varied from 47°F. to 87°F. and averaged 69°F. Weed control and crop injury ratings were recorded 8 and 29 days after herbicide application. The following gives the herbicides which showed promising selectivity (the lower figure, the minimum rate which gave satisfactory weed control; the higher figure, the maximum rate which gave no crop injury). For onions: 6-8 lb CIPC only; for carrots: $\frac{1}{4}$-4 lb Prometryne, $\frac{1}{4}$-3 lb DuPont 326, $\frac{1}{4}$ lb Atrametryne; for cabbage: $\frac{1}{2}$-2 lb Prometryne and $\frac{1}{4}$ lb Atrametryne. None of the herbicides gave selective control of weeds in beets. (Paper No. 4725 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station.)

Variable dosage sprayer application of herbicides as pre- and post-emergence sprays to four vegetable crops growing in Waukegan silt loam soil, 1961. Nylund, R. E. and D. C. Nelson. Straight Eight cucumbers, Perfection Freezer peas, Topcrop snapbeans, and Golden Delicious squash seeded May 23 in a silt loam soil having 5.6% O.M. and pH 5.5 were sprayed immediately after seeding with the following herbicides: 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea (DuPont 326); N,N-dimethyl-2,2-diphenylacetamide (Diphenamid); dioleylamine salt of

endothal (Pennsalt TD 66); amiben; 2,4-bis(isopropylamino)-6-methylmercapto-s-triazine (Prometryne); 2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine (Atrametryne); and 2-chloro-4-ethylamino-6-(3-methoxypropylamino)-s-triazine (G-34696). All herbicides were applied with a variable dosage sprayer at 30 psi pressure in 74 gpa water to duplicated plots. Each plot consisted of four 110' rows (single rows of each plot) seeded 12" apart. Every third plot was on untreated control. To assure a uniform weed population, seeds of Brassica hirta and Setaria italica had been broadcast on the plot area and disced in during seedbed preparation. In addition to those planted, Amaranthus retroflexus and Portulaca oleracea were important weeds. At the time of spraying the temperature was 65°F., the woil surface was dry, and no weeds had emerged. Temperatures during the first two weeks following spraying ranged from 35°F. to 85°F. and averaged 62°F. Rainfall during this period fell only on May 31 (1.20"). Weed control and crop injury ratings were recorded 21 and 38 days after spraying. The following gives the herbicides which showed promising selectivity as preemergence sprays (the lower figure, the minimum rate which gave satisfactory weed control; the higher figure, the maximum rate which gave no crop injury). For peas: 2-4 lb. Prometryne, 2-4 lb. Atrametryne, 2-4 lb. G-34696, 1-5 lb. DuPont 326, 7-10 lb. Diphenamid, and 3-6 lb. amiben. For snapbeans: 2-3 lb. Atrametryne, 2-4 lb. G-34696, 1-4 lb. DuPont 326, 7-10 lb. Diphenamid, and 3-4 lb. amiben. For squash: 2-3 lb. Prometryne, 2-3 lb. Atrametryne, 1-3 lb. DuPont 326, 7-8 lb. Diphenamid, and 3-4 lb. amiben. For cucumbers: 4-8 lb. Diphenamid and 3-4 lb. amiben. The above herbicides, except amiben, were also applied as postemergence sprays to another series of plots planted as above. At the time of spraying (June 12) peas were at the 4-6 node stage, snap beans at the first leaf to early first trifoliate leaf, squash at 1-3 leaf, and cucumber at the early one-leaf stage. Temperature at the time of spraying was 82°F., humidity was 70%, and soil surface was wet. Temperatures during the first two weeks following spraying averaged 64°F. and rain fell on June 18 (0.10"), June 19 (0.35") and June 21 (0.75"). Weed control and crop injury ratings recorded 8 and 18 days after spraying showed that none of the herbicides tested gave weed control without accompanying severe crop injury. (Paper No. 4726 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station.)

Pre- and post-harvest weed control in asparagus, 1961. Nylund, R. E., and D. C. Nelson. Plots in a nine-year-old asparagus planting growing in Waukegan silt loam soil were sprayed on May 5 immediately following spring discing, with the following herbicides: 4 and 8 lb/A N,N-dimethyl-2,2-diphenylacetamide (Diphenamid), 3 lb/A monuron, and 10 lb/A dalapon. The same herbicide treatments, except the 4 lb/A rate of Diphenamid, were applied to another series of plots immediately following the postharvest discing on June 14. Each treatment was applied at 35 psi pressure in 40 gpa water to plots 6' x 22½' as over-the-row band applications 3' wide. Treatments were randomized in each of 4 blocks. At the time of the pre-harvest herbicide applications were made the temperature was 45°F. and humidity 98%. Rain during the first two weeks following treatment fell on May 6-7 (0.77"), May 14-15 (1.27"), and May 17-18 (0.82"). The principal weed species which emerged in the control plots in the spring were water foxtail (Alopecurus geniculatus), purslane speedwell (Veronica peregrina), and dandelion (Taraxacum officinalis). At the time of the post-harvest herbicide applications (June 14) the temperature was 60°F., and humidity 40%. Rainfall during the two weeks following was: June 18-19 (0.61") and June 21 (0.26"). Principal weed species which emerged following post-harvest discing were Amaranthus retroflexus and Portulaca oleracea. Weed control ratings recorded one month after the pre-harvest herbicides applications showed that 8 lb/A Diphenamid gave excellent control and the other herbicides only fair control of broad-leaved weeds (Taraxacum

and Veronica). The 8 lb/A rate of Diphenamid and 10/A dalapon both gave excellent control of grassy weeds (principally *Alopecurus*) while the others gave fair to good control. Of the herbicides applied after post-harvest discing, only 3 lb/A monuron showed excellent weed control one month after treatment (July 18). However, in the plots which had been sprayed in early spring, the 8 lb/A Diphenamid treatment was still giving excellent weed control at this date in spite of the fact that the plots had not been retreated following post-harvest discing. None of the treatments caused any apparent injury to the asparagus plants. (Paper No. 4733 of the Scientific Journal Series of the Minnesota Agriculture Experiment Station).

Weed control in potatoes on sandy soil. Rake, L., Holm, L., and Groskopf, M. Herbicide experiments to study crop tolerance and weed control were conducted on Plainfield sand in central Wisconsin in 1960. In late April, 1961, a similar experiment was begun to confirm or explore further the results obtained previously. Russet Burbank potatoes were planted in a three replication block experiment. Irrigation was used to supplement normal rainfall throughout the season. Yield data were obtained in early September. The principal weeds in the area were lambsquarters, pigweed, yellow foxtail, common ragweed, and field bindweed. Stand counts of weeds by species were made two weeks after emergence of the potatoes. The following herbicides were applied 7 days after the potatoes were planted (L and G used to designate liquid and granular): EPTC, 5 and 10, L and G; dalapon, sodium salt, 5 and 10, L and G; DNBP, 3 and 6, L and G; amiben, triethylamine salt, 3 and 6, L and G; trietazine, 2 and 4 L; atrazine, 1 and 2, L and G; neburon, 2 and 4 L; and Casoron (2,6-dichlorobenzonitrile), 2 and 4, L and G. Dalapon 2½ mixed with DNBP 3 was applied at the time of potato emergence. All treatments gave very good control of bindweed. Ragweed stands were reduced significantly by EPTC 5 G and 10 L and G; dalapon 5 L and 10 L and G; DNBP, 3 and 6 L and G; amiben 6 L; trietzine 4 L; atrazine, 1 and 2 L and G; and the mixture of DNBP and dalapon. Grassy weed stands were reduced significantly by EPTC, 10 L and G; and amiben, 6 L. Pigweed stands were reduced significantly by EPTC 5 G and 10 L and G; DNBP, 3 and 6 L and G; amiben, 3 and 6 L and G; trietazine 2 and 4 L; atrazine, 1 and 2 L and G; neburon, 4 L; and Casoron, 2 and 4 L and G. Lambsquarter stands were reduced significantly by EPTC 5 G and 10 L and G; dalapon 10 G; DNBP 3 and 6 L and G; amiben 3 and 6 L and G; trietzaine, 2 and 4 L; atrazine 2 and 4 L and G; neburon 2 and 4 L; and Casoron, 2 and 4 L and G. Potato yields were reduced significantly by dalapon 5 G and 10 L; trietzaine 4 L; neburon 2 and 4 L, and casoron, 2 and 4 L and G. Atrazine was severly toxic to the crop. (Department of Horticulture, University of Wisconsin, Madison, Wisconsin).

Preplanting, preemergence, and postemergence weed control in cucumbers. Rake, L. Holm, L., and Groskopf, M. In early June SMR-12 cucumbers were planted in a Plainfield sand in a 4-replicate block experiment. One inch of irrigation water was applied following preplanting and preemergence treatments. Irrigation water supplemented natural rainfall throughout the season. The predominant weeds in the area was lambsquarters, carpet weed, and yellow foxtail. The cucumbers were thinned to 14 inches in the row and weed stand counts were taken 4 weeks after crop emergence. Just before planting, the following herbicides were applied and incorporated into the soil with a "weeder" implement (liquid and granular applications designated L and G respectively): NPA, sodium salt, 4 lb/A L and G; amiben, 4 L and G; and CDEC, 4 L and G. Preemergence treatments were as follows: simazine, 1 and 2 L, Dacthal (2,3,5,6-tetrachloroterephthalic acid, dimethyl ester) 6 and 12 L. At emergence of the crop NPA 4 L mixed with DNBP 2 L was applied. The following postemergence treatments were made when cucumbers were in the 6-leaf stage: Dicryl (*N*-(3,4-dichlorophenyl)methacrylamide) 2 and 4 L;

Casoron (2,6-dichlorobenzonitrile) 4 L; Solan (N-(3-chloro-4-methylphenyl)-2-methylpentanamide) 4 L; together with mixtures of Dicryl 3 L with NPA 2 L; and dicryl 3 L with casoron 2 L. The preplanting treatments of amiben and of NPA, 4 lb/A L and G, controlled 80% of the broadleaved weeds and grasses. CDEC controlled 60% of the broadleaved weeds. Dacthal at 6 and 12 gave 60% control of grasses and 30% control of broadleaved weeds. Dicryl, Casoron, and Solan, alone and in mixtures, were not effective. The yields of cucumbers in all treatments showed no significant reductions except for simazine and DNBP which were very injurious. There were no important differences between liquid and granular treatments. In a similar, but more detailed experiment with only NPA, amiben, and DNBP in 1960, NPA 3 and 6 L controlled 80% of the weeds as a preplanting treatment, but only 60% as a preemergence treatment. Very similar results were obtained with amiben. These two herbicides did not affect yield. DNBP gave poor weed control in all cases and reduced the crop yield. (Department of Horticulture, University of Wisconsin, Madison, Wisconsin).

Crabgrass control with preemergence herbicides. Switzer, C. M. Herbicides were applied April 27, 28 and May 1, 1961 to 100 sq.ft. plots in a randomized design replicated 4 times on the Ontario Agricultural College campus. Liquid materials were sprayed (100 gal/A) from a knapsack sprayer and granulars were distributed by means of a fertilizer spreader. Rain (0.78 in.) fell during the period from April 29 to May 3. First crabgrass emergence in the control plots was noted on May 15. Notes on turf injury and crabgrass control were taken June 26, July 21 and August 23. Excellent control of crabgrass with no injury to other grasses was given by O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron) (both liquid and granular formulations) at 8, 16 and 24 lb/A, dimethyl 2,3,5,6-tetrachloroterephthalate (Dacthal) (liq. and gran.) at 5, 10 and 15 lb/A, diphenylacetonitrile (Diphenatrile) at 20, 30 and 40 lb/A, and N,N-di-n-propyl-2,6-dinitro-4-methylaniline (Dipropalin) at 4, 6 and 8 lb/A. Calcium propyl arsonate was good at 60 lb/A but not satisfactory at 20 or 40 lb/A. Clover was strongly inhibited by this herbicide. Pas (36.5% metallic arsenic) gave good control at 3 pounds of formulation per 100 sq.ft. as did Chip Cal (50% tricalcium arsenate) at 2 lb. of formulation per 100 sq.ft. Poor results were obtained when lower rates (1 and 1½ lb/100 sq.ft.) were used. N,N-di-n-propyl-2,6-dinitro-4-trifluoromethylaniline (Trifluralin) caused marked burning of all plants in the plots at 4, 6 and 8 lb/A. Therefore, it was not satisfactory even though it gave 100% control of crabgrass. (Dept. of Botany, Ontario Agricultural College, Guelph, Ontario.)

Residual effects of some herbicides used for control of Crabgrass in turf. Switzer, C. M. An area treated with various herbicides on May 12, 1960, (see Res. Rept. Nat'l. Weed Comm., East. Sec. (Canada) Pg. 102, 1960) was observed throughout the summer of 1961. Some crabgrass was found in all plots but those treated with O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron) at 8, 16 and 24 lb/A (either liquid or granular) and those treated with tricalcium arsenate at 15 lb/1000 sq.ft. or with dimethyl 2,3,5,b-tetrachloroterephthalate (Dacthal) granular at 15 lb/A had considerably less than the others. Control with both 16 and 24 lb/A of Zytron exceeded 90% throughout the summer. The 8 lb. rate (granular) gave fair control, but liquid Zytron at 8 lb/A did not have as much residual effect. In another experiment, set up to study the effectiveness of fall application of preemergence crabgrass herbicides, plots were treated on Nov. 14, 1960, with Zytron, liquid and granular (10, 20, 30), Dacthal, wettable powder and granular (10, 15, 20), and tricalcium arsenate (5, 7½, 10, 15). Rates of Zytron and Dacthal are lb. active/A, and of tricalcium arsenate are lb. active/1000 sq.ft. Only the plots receiving the low rate of Dacthal granular and the two

lowest rates of tricalcium arsenate were not completely free of crabgrass on July 21, 1961. However, by Aug. 31, crabgrass was noted in all plots except those receiving 20 or 30 lb. of Zytron or 20 lb. of Dacthal, although plots treated with Zytron 10, Dacthal 15 or tricalcium arsenate 15 contained only a few crabgrass plants. Only the highest rate of Zytron caused any turf damage (some thinning) and even those plots recovered by early June. A marked stimulation of bluegrasses was noted in all Zytron treated plots. (Department of Botany, Ontario Agricultural College, Guelph, Ontario.)

FORESTRY, ORNAMENTAL NURSERIES, AND SHELTERBELTS

Leaching and movement of simazine and propazine in forest nursery soil. Kozlowski, T. T. and Kuntz, J. E. Among herbicides tested for weed control in forest nurseries and plantings, certain triazines have special interest. Simazine at 2 lb/A was sprayed onto Plainfield sand held in paper cylinders. After 6 days, 10 cartons were leached with 2 inches of water; 10 others, with 4 inches of water. Untreated control cartons also were leached. Two days later, each carton was sliced horizontally into 6 sections, each 1-inch thick. Each section was planted with 25 oat seeds. After 25 days, the tops of all oat seedlings were harvested, dried, and weighed. Propazine was tested similarly. Seed germinated rapidly and uniformly. Simazine, leached with 2 inches of water, caused severe growth depression and mortality in the upper inch of soil, somewhat less in the 2nd and still less in the 3rd inch. No symptoms nor growth effects were evident in oats grown in the 4th, 5th, or 6th inches of soil. Leaching with 4 inches of water, however, caused reduced growth down through the 5th inch of soil. Leaching of propazine, likewise, caused greatest growth reduction and mortality in the upper inch of soil. Increased leaching induced symptoms and growth reduction in progressively lower layers of soil down to the 5th inch. Both experiments demonstrated the difficulty of removing simazine and propazine in the upper soil layers, even of light sandy soil and explained, in part, why older tree seedlings and transplants "escape" injury. (Departments of Forestry and Plant Pathology, University of Wisconsin, Madison, Wisconsin.)

Effect of propazine and eptam on growth of red pine seedlings of varying age. Kuntz, J. E. and Kozlowski, T. T. Field studies involving several selected herbicides have demonstrated that rate, timing, and method of application were critical, especially in nurseries and plantings of different species and different age classes. These factors were studied further under semicontrolled, greenhouse conditions. EPTC at 6 lb/A and propazine at 2 lb/A were sprayed separately to different flats of Plainfield sand at the time of seeding with red pine and at 2, 4, and 8 weeks after seeding. Seed germination began 10 days after seeding and was uniform. Eleven weeks after seeding, the seedlings in each plot were counted, harvested, dried, and weighed. Propazine applied at 0, 2, and 4 weeks after seeding caused severe injury, increasing growth reductions, and varying mortality. Treatment after 8 weeks caused no apparent injury. EPTC, in marked contrast, caused little injury to pine seedlings. Seedling survival and growth was only slightly higher when Eptam application was delayed after seeding. In other greenhouse experiments, propazine, as a preemergence spray, caused increasing growth reductions and mortality at rates of 1, 2, and 4 lb/A. (Departments of Plant Pathology and Forestry, University of Wisconsin, Madison, Wisconsin.)

Effect of Dacthal on red pine seedlings of varying age. Kuntz, J. E. and Kozlowski, T. T. Since Dacthal (dimethyl 2,3,5,6-tetrachloroterephthalate) is reported to control carpetweed, purslane, chickweed, and witchgrass, most common in forest nurseries, rates of 1 and 2 lb/A were applied as preemergence and postemergence sprays to different replicated flats of autoclaved Plainfield sand at the time of seeding with 400 red pine seeds and 7 weeks later. Uniform seedling emergence began 10 days after seeding. During the growing period, seedlings in all treated flats appeared as healthy and as vigorous as did seedlings in untreated (control) flats. Eleven weeks after seeding, the seedlings in each plot were counted, harvested, dried, and weighed. Final seedling stands were comparable in all treated and untreated flats with only slight reductions in total dry weights of the preemergence treatments. Other

similar experiments tested Dacthal at 6 and 8 lb/A as a postemergence treatment. Again, treated pine seedlings appeared as vigorous as untreated seedlings, final seedling counts were comparable, and total dry weights of the treated seedlings were reduced only slightly. (Departments of Plant Pathology and Forestry, University of Wisconsin, Madison, Wisconsin.)

Relative toxicity of simazine and monuron to Caragana arborescens. Grover, R. Sixty-four samples of 25 uniform and stratified seeds of caragana were sown in 1/2" deep rows in sand on December 23, 1960. Presowing treatments of simazine and monuron at rates of 0, 1, 2, and 4 lb/A were applied on December 19, before sowing the seed. Preemergence treatments, with the same rates for both the herbicides, were applied on December 27. There were four replicates for each treatment. Moisture levels in sand were maintained at their maximum with Buoyoucos meters (85 ± 5%). Nutrient solutions were applied twice weekly. Germination records were taken daily from December 28, 1960 to January 15, 1961. On January 19, each row was harvested separately and data were recorded for the number of plants in each row and the dry weights of seedlings computed after oven drying the plants at 70°C for 3 days.

Rate lb/A	Dry Weight, per cent of Control			
	Presowing		Preemergence	
	Simazine	Monuron	Simazine	Monuron
0	100	100	100	100
1	47	42	60	50
2	44	39	59	41
4	42	41	57	41

No appreciable differences were observed in percent germination and rates of seedling emergence for any herbicidal treatment or their time of application and between the controls. Mortality of the seedlings was high, 80 - 100% of the emerged seedlings being killed or severly damaged by all treatments. Data on dry weights showed that both simazine and monuron, were equally toxic to caragana when used as presowing treatments. On the other hand, when used as preemergence treatments, simazine is somewhat less injurious than monuron. The delayed effect of simazine, in the latter case, is attributed to its low solubility. (Contributed by the Forest Nursery Station, Research Branch, Canada Department of Agriculture, Indian Head, Sask.).

Fall application of simazine for weed control in evergreen nurseries. Grover, R. Three- (2 + 1) year-old plants of Colorado spruce, white spruce, and Scots pine were sprayed with simazine on November 7, 1960. Control plots were left untreated. Rates of 1, 2, and 4 lb/A, in 40 gal/A of water, were applied with a knapsack sprayer, with four replicates of each treatment. The soil, an oxbow boulder-tile clay, with a pH of 8, was moist at the time of application and was under sprinkler irrigation during the following growing season. Check and treated areas were free from weeds at the time of application. Results were determined by observing visual damage to the plants and taking weed counts at frequent intervals. The weeds were removed after each count. Simazine at 2 lb/A gave excellent control of annual weeds all through the following spring and continued to do so till early fall of 1961. No apparent injury or stunting of growth was observed for Colorado spruce. Eleven to fourteen percent of the Scots pine plants were killed or damaged at 2 and 4 lb/A rate, with no apparent injury at 1 lb/A rate. White spruce, on the other hand, showed increasing damage with increase in simazine concentration. Colorado spruce again,

appears to be tolerant to simazine at rates which are also effective for weed control.

Conifer species	Observations	Per Cent at indicated rate, lb/A 4	2	1	Control
Colorado spruce	Weed control	98	99	84	0
	Plants damaged	22	25	27	26
White spruce	Weed control	99	99	96	0
	Plants damaged	31	24	22	9
Scots pine	Weed control	98	99	84	0
	Plants damaged	11	14	1	1

(Contributed by the Forest Nursery Station, Research Branch, Canada Department of Agriculture, Indian Head, Sask.).

<u>Logarithmic evaluation of simazine for weed control in evergreen nurseries.</u> Grover, R. Three- (2 + 1) year-old plants of Colorado spruce, white spruce, and Scots pine were logarithmically sprayed on June 2, 1961, with simazine, the highest dosage being 8 lb/A. The plants were growing in nursery rows, 12" apart. The soil, an oxbow boulder-tile clay with pH 8, was under sprinkler irrigation throughout the growing season. Natural precipitation was very low (only 2.5 inches during the growing season). The mean low and high temperatures were considerably higher than the normal. Results were determined by observing visual damage to the plants, heights of plants before treatment and at the end of growing season, and taking weed counts at frequent intervals. The weeds were removed after each count. Weed counts were taken on plots, 1 x 3 yd. with 1-yard axis centered on half-dosage distance marks, with two similar plots for control. Height data were recorded on thirty-five plants selected from seven one-yard rows centered on half-dosage distance marks. Dosage levels, therefore, are actually ranges of rates. Weed control is reported as a percent of the check treatment. Increase in height is expressed as percent increase from the start of the treatment for each rate separately and is an average of 35 plants. Plants damaged or killed are expressed as percent of plants damaged in each treatment. It is seen that excellent weed control was obtained with simazine with rate of 2 lb/A and above. Growth of the three species, as expressed by percent increase in height, was retarded by simazine at all concentrations, except perhaps at the lowest (in case of Scots pine only). There was visual damage to Colorado spruce, 44% and 11% being killed or damaged at 8± and 4± lb/A rate. No damage was observed at lower rates. White spruce and Scots pine on the other hand showed increasing damage to the plant, with the increase in simazine concentration.

Conifer species	Observations	Per cent at indicated dosage range, lb/A 8±.50	4±.25	2±.15	1±.05	Check
Colorado spruce	Weed control	99	98	91	33	0
	Height increase	38	37	36	36	43
	Plants damaged	44	11	1	1	2
White spruce	Weed control	99	99	99	45	0
	Height increase	36	38	35	43	46
	Plants damaged	39	29	19	20	13
Scots pine	Weed control	99	99	97	38	0
	Height increase	9	11	14	21	21
	Plants damaged	16	10	12	8	3

It would appear that simazine was highly injurious to white spruce and Scots pine. Colorado spruce, on the other hand, seems to tolerate simazine up to 2 lb/A, without showing any visual damage, although the height growth of this species was retarded even at this low rate. (Contributed by the Forest Nursery Station, Research Branch, Canada Department of Agriculture, Indian Head, Sask.).

Logarithmic evaluation of propazine for weed control in evergreen nurseries. Grover, R. Three- (2+1) year-old plants of Colorado spruce, white spruce, and Scots pine, were logarithmically sprayed with propazine on July 5, 1961, the highest dosage being 8 lb/A. Cultural, soil, and climatic conditions and the procedure for the evaluation of data from logarithmically sprayed plots, are discussed in the first report on simazine evaluation. Data on height increase was not recorded. The data on weed control and injury to plants by propazine are presented below:

Conifer species	Observations	Per cent at indicated dosage range, lb/A				
		8±.50	4±.25	2±.15	1±.05	Check
Colorado spruce	Weed control	99	88	75	44	0
	Plants damaged	67	8	10	9	4
White spruce	Weed control	98	75	57	32	0
	Plants damaged	22	12	9	16	10
Scots pine	Weed control	93	72	36	26	0
	Plants damaged	3	5	2	2	3

There was effective weed control with propazine at rates of 4 lb/A and above. Colorado spruce (67%) and white spruce (22%) were damaged or killed at concentrations of 8± lb/A. No appreciable damage was observed at lower concentrations. Scots pine did not show any visual damage for any of the rates of propazine studied. Propazine at 4 lb/A offers promise as a herbicide for conifer nurseries. (Contributed by the Forest Nursery Station, Research Branch, Canada Department of Agriculture, Indian Head, Sask.).

Logarithmic evaluation of simazine for weed control in and phytotoxicity to 1-year-old Colorado spruce in seedbeds. Grover, R. One-year-old plants of Colorado spruce were logarithmically sprayed with simazine on June 2, 1961, the highest dosage being 4 lb/A. The plants were growing in a nursery seedbed and thinned to form rows of seedlings 6" apart. Peat moss and sand amendments were added to the soil, an oxbow boulder-tile clay, pH about 8, before sowing the seed. The seedbeds were under sprinkler irrigation all through the growing season. Results were determined by observing visual damage and by recording fresh weights of plants and the lengths of roots and shoots after harvesting the plants on October 2, 1961. The weed counts were taken at frequent intervals, the weeds being removed after each count. The data were taken on four rows of seedlings, centered on half-dosage distance marks. Dosage levels, therefore, are actually ranges of rates.

Observations	Dosage range lb/A				
	4±.25	2±.15	1±.05	1/2±.02	Check
Weed control (%)	100	89	89	0	0
Plants damaged (%)	12	6	5	8	12
Fresh weight (gm/1000)	342	788	682	869	431
Root length (cm)	9.5	15.0	14.0	15.2	13.9
Top height (cm)	6.3	8.2	8.2	8.1	7.6

Effective weed control was obtained with simazine at rates of 1+ lb/A and above. Simazine at 4 lb/A decreased not only the fresh wt/1000 seedlings, but also materially reduced the development of roots and tops. Lower rates of simazine seemed to enhance the growth of the seedlings. Spring applications of simazine at rates of 1-2 lb/A would appear to offer promise for weed control in 1-year-old Colorado spruce beds. (Contributed by the Forest Nursery Station, Research Branch, Canada Department of Agriculture, Indian Head, Sask.).

Logarithmic evaluation of triazine herbicides for weed control in evergreen seedbeds. Grover, R. Seed of Colorado spruce and Scots pine were sown on May 16/17, 1961. The soil, an oxbow boulder-tile clay, pH about 8, was improved with amendments of peat moss and sand before sowing the seed. The seedbeds were under sprinkler irrigation all through the growing season. Simazine was sprayed logarithmically on June 2, 1961, when the seedlings had just emerged, the highest dosage being 4 lb/A. Propazine was applied on July 18, 1961 and on Scots pine only. Data were then taken on 2 x 2' plots centered on half-dosage distance marks. The dosage levels, therefore, are ranges of rates. Results were determined by observing visual damage and by survival and fresh weight of seedlings in each plot.

Conifer species	Herbicide	Observations	Dosage range (lb/A) 4±.25	2±.15	1±.05	1/2±.02	Check
Colorado spruce	Simazine	Weed control (%)	100	90	80	60	0
		Sdlg. survival (%)	.1	9	42	59	100
		Sdlg.wt. (gm/1000)	50	107	140	168	132
Scots pine	Simazine	Weed control (%)	100	99	86	55	0
		Sdlg. survival (%)	0	2	21	65	100
		Sdlg.wt. (gm/1000)	-	-	81	171	180
	Propazine	Weed control (%)	99	92	65	26	0
		Sdlg. survival (%)	110	105	99	102	100
		Sdlg.wt. (gm/1000)	117	146	147	196	202

Effective weed control was obtained by simazine at 1+ lb/A and by propazine at 2 lb/A and above. The seedling stands were drastically reduced by simazine at all rates and in both species tested. Propazine, on the other hand, did not affect the percent survival of seedlings. Simazine also reduced the fresh weights of seedlings of both species, except for Colorado spruce, where there was an actual increase in fresh weights per 1,000 seedlings at lower rates. Propazine also reduced the fresh weight/1,000 seedlings at rates of 1 lb/A and above. (Contributed by the Forest Nursery Station, Research Branch, Canada Department of Agriculture, Indian Head, Sask.).

BASIC STUDIES

<u>Effect of foliage treatments with (2-chloroethyl)-trimethylammonium chloride (CCC) on growth of Thatcher wheat</u>. Vanden Born, Wm. H. Quadruplicate plots for each treatment were seeded with Thatcher wheat on May 18. On May 30, when the third leaf was just visible on some plants, plots were sprayed with 0, 2, 4, 8, 16, and 24 lb/A of CCC in 10 gpa water. Severe leaf burning was caused by the higher rates, with 24 lb/A causing the death of up to 60 percent of the plants. Some burning injury was visible even at the 2 lb/A rate. On June 28, when plants were in the late shotblade stage, plots previously untreated were sprayed with 2, 4, 8 lb/A CCC. Some plots which had previously been sprayed with 2, 4, and 8 lb/A were retreated with 2, 4, and 8 lb/A and plots sprayed with 16 lb/A at the first stage were given a second application of 8 lb/A. At the second stage the spray volume was increased from 10 gpa to 30 gpa to reduce contact injury. A treatment designated as 16-8 shall mean 16 lb/A at stage <u>1</u> followed by 8 lb/A at stage 2. Wheat yields varied considerably, partly due to some bird damage, and no consistent gradients could be observed, though there was some suggestion of a slight yield increase from all except the highest rate of application. The total number of tillers per square yard was nearly the same for all treatments, while the number of plants per square yard was reduced only by the 24-0 treatment, resulting in a 50 percent increase in number of tillers per plant. Aside from this observation, no marked increase in number of tillers per plant occurred (range 2.1 - 2.6). Most marked effects of treatment with CCC were on plant height, color and maturity. Rates of 2, 4, 8, 16, and 24 lb/A CCC reduced mean plant height by 0.9, 0.4, 2.3, 3.4, and 4.8 inches (up to 17 percent) when applied at the first stage. Treatments 0-2, 0-4, 0-8 reduced mean plant height 1.7, 3.2, 3.5 inches, suggesting that application at the later stage was more effective in reducing plant growth in height. Repeated applications were more effective than equivalent total rates applied at stage 1, but less so than corresponding treatments at stage 2, in reducing plant growth in height. Reduced height was accompanied by a marked bluish colour of the plants. Highest rates of application caused a delay in maturity, probably due in part to the initial contact injury, especially following treatment at stage 1. (Division of Crop Ecology, Department of Plant Science, University of Alberta).

WOODY PLANT CONTROL

Mechanical cutting and herbicides to control woody growth on native range. Friesen, H.A. Plots of two acres, containing wolf willow, Western snowberry and wild roses were sprayed with isopropyl ester O42,4-D and a Brushkill (1:1 mixture of 2,4-D and 2,4,5-T esters) at 1.5 and 2.0 lb/A in 15 gal/A of water in mid-June, 1960. In early August of 1960 similarly large plots containing these species were cut with a rotary mower. In 1961 the plots sprayed with brushkill in 1960 were cut with a rotary mower, while the regrowth on the plots mowed in 1960 was sprayed in mid-June with 2,4-D ester and brushkill at 1 and 2 lb/A and silvex at 1 lg/A. Water at 15 gal/A was the diluent. Regrowth on the plots sprayed in 1960 was slow and sparse averaging about one small sucker or new shoot per cut stem in September of 1961. In contrast where the species were not sprayed prior to mowing regrowth was strong, being over 1 foot tall in mid-June. Each of the spray treatments in 1961, killed these new shoots to the ground but by early August, regrowth equivalent to 2 shoots per cut stem had again reached a height of 1 foot and respraying was carried out. There was no apparent difference in the degree of control between the herbicides except on the roses, where the Brushkill and silvex were superior. Further spray treatment will be necessary in 1962 to effect a lasting control. (Contributed by the Experimental Farm, Lacombe, Alta.)

Oak wilt control with fumigants in heavy soils. Kuntz, J. E. and Drake, C. R. In Wisconsin, the oak wilt fungus (*Ceratocystis fagacearum* (Bretz) Hunt), commonly spreads from an infected oak to adjacent healthy oaks through underground root grafts. Control of such spread has been achieved either (a) by poisoning with sodium arsenite adjacent healthy oaks or (b) by breaking or cutting all connecting roots. More recently, soil fumigants including SMDC (Vapam) and methyl bromide have effectively killed portions of oak roots growing in Plainfield sand, have induced vascular plugging, and thereby have prevented fungus movement beyond (NCWCC, 1960). Results were confirmed by additional data taken in 1961. Similarly, soil injections with Vapam (50, 100, 200, or 400 ml of a 1:10 dilution in water per hole, approximately 1½ inch diameter, punched at 1 foot intervals and to depths successively of 1½, 2, 2½, and 3 feet) in heavy soils (Miami silt loam) killed portions of roots and, after 3 years, have prevented further spread of oak wilt in most cases. In contrast to the extensive root kill following high dosages in light sandy soil, much smaller root sections were killed in heavy soils and no foliage injury appeared on any of the nearby trees. Root kill was more uniform at the higher dosages. Similar results followed injections of methyl bromide at 1 lb/5, 10, 15, or 20 linear feet. (Departments of Plant Pathology and Forestry, University of Wisconsin, Madison, Wisconsin.)

Forest firelane weed control with granular Urox and Urab and their effects on adjacent forest trees. Kuntz, J. E. and Dosen, R. C. In June, 1959, granular monuron TCA (Urox) at 11, 22, 33, 44, 66, and 88 lb/A, was broadcast uniformly to established weeds in replicated 1/100A firelane plots, bordered by pine plantations or natural oak-pine stands. First-season weed control was excellent at 66 and 88 lb/A, but decreased progressively at the lower rates. Slight foliage injury also developed on northern pin oaks (*Quercus ellipsoidalis* Hill), 4-8 inches dbh, growing within 20 feet of the treated areas. During the second season, rates of 22, 33, 44, 66, and 88 gave excellent weed control (nearly complete kill), but caused increasingly severe injury and mortality to jack pine (*Pinus banksiana* Lamb.), 3 to 6 inches dbh, growing within 15 feet of the treated area. Bordering northern pin oaks showed increasing foliage injury

at 44 lb/A and above, but bur oaks (Q. macrocarpa Michx.) tolerated even the higher rates. During the third season, sparse regrowth of sedge and grass occurred even at the higher rates. Fenuron TCA (Urab), similarly tested, gave better weed control the first season, but permitted considerable regrowth the second year. Both oaks and pine were severly injured at the higher rates. (Department of Plant Pathology and Forestry, University of Wisconsin, Madison, Wisconsin, and Nekoosa Edwards Paper Company, Port Edwards, Wisconsin.)

AQUATIC WEED CONTROL

Aquatic weed control research in Indiana. Guse, Lynn R. Evaluations were made of herbicides for control of aquatic weeds in 15 ponds in Indiana. In addition to use of spot treatment techniques for evaluating the chemicals, polyethylene enclosures constructed of 4 mil clear polyethylene, were utilized with satisfactory success. The use of the enclosures allowed the evaluation of many chemicals at varied concentrations in the same body of water. In general, evaluation of herbicidal effectiveness was difficult in spot treatments. Results obtained were as follows. Algae: Continued satisfactory results were obtained with copper sulfate at 1 ppmw. Diquat at 5 ppmw satisfactorily controlled the species commonly found in Indiana, *Spirogyra*, *Hydrodictyon*, *Oscillatoria*, *Anabaena*, *Cladophora* and *Chara* spp. Materials giving unsatisfactory results were copper methanearsonate and silver methanearsonate at 5 ppmw; 2-amino-3-chloro-4-napthoquinone at 0.1 ppmw; dichlone at 0.15 ppmw; and 2,4-D lithium salt at 44 ppmw. Sodium salt of endothal was not generally satisfactory in the control of algae, however, the granular material at 3 ppmw did control *Chara vulgaris*. Algae control was generally not satisfactory with either granular or wettable powder formulations of simazine and atrazine. However, *Chara vulgaris* was controlled with simazine wettable powder at 5 ppmw but not with granular simazine. Submerged aquatics: Chemicals that gave satisfactory results of the most troublesome weeds in this group, pondweeds (*Potamogeton* spp.), watermilfoil (*Myriophyllum* spp.), coontail (*Ceratophyllum* spp.), and waterweed (*Elodea* spp.) were silvex at 5 lb/A ft; the potassium salt of silvex at 2 ppmw; sodium salt of endothal at 1-4 ppmw; diquat at 5 ppmw and 2,4-D ester at 3 ppmw. Control with simazine wettable powder was erratic while control with granular simazine was generally satisfactory. Atrametryne gave satisfactory control of submerged species at 4 and 5 ppmw, however, irritation and kill of small fish was noted. Emergent species: Continued effective results on cattail, rushes and phragmites were obtained with 20 lb dalapon and 10 lb amitrole per 100 gal. water. Amitrole-T at 1 gal. per 100 gal. water (recommended rate for north central states) did not give complete control of cattails, however it did control reed canarygrass which has become a problem in some drainage ditches and pond edges in Indiana. Dalapon at 20 lb per 100 gal. water also satisfactorily controlled this grass. The addition of detergent hastened control in all cases. Water lilies were controlled with silvex, the potassium salt of silvex, and 2,4-D. Duckweed (*Wolffia*, *Spirodela*, *Lemna* spp.) is a problem on many Indiana ponds. 2-amino-3-chloro-4-napthaquinone at 10 lb/A was the only material giving satisfactory control of these species. Materials giving unsatisfactory results were tris(1-dodecyl-3-methyl-2-phenylbenzimidazolium) ferricyanide, at 25 ppmw; copper methanearsonate and silver methanearsonate at 5 ppmw; diquat at 4 lb/A; dichlone at 10 lb/A; 2,4-D lithium salt at 7 ppmw; liquid sodium salt of endothal at 5 gal/A; dalapon at 20 lb/A; diesel oil and kerosene. Department of Botany and Plant Pathology, Purdue University, Lafayette, Ind.

Aquatic weed control research in central Illinois. Hiltibran, Robert C. Field tests conducted during 1959 and 1960 indicated that disodium endothal was toxic to *Potamogeton crispus*, *P. foliosus*, and *P. pectinatus* when applied at a rate of 1 ppmw. *Potomageton pectinatus* cannot be controlled by sodium arsenite. *Ceratophyllum demersum* and *Myriophyllum* spp. were controlled with endothal applied at rates of 3 to 5 ppmw but were not controlled with dosages of 1 ppmw. On *P. pectinatus* liquid preparations appeared to be as effective as granular preparations when both were applied at the same rate. However, the effect of the toxic action of the liquid was slow to develop. During 1961, liquid and granular endothal were applied to beds of *P. crispus* at 0.8 ppmw and *P. foliosus* at 1 ppmw both treatments appeared to be equally effective in approximately the

same length of time. Neither preparation was effective on *Dianthera americana* or *Jussiaea diffusa*, but both were effective on *Sagittaria latifolia* at rates of 25 ppmw. In 1959 granular endothal applied at the rate of 5 ppmw was not effective on *Chara*; this observation was confirmed in 1961. The floating leaves of *P. nodosus* and *P. vaseyi* largely disappeared after an application of endothal at a rate of 50 ml diluted to one gallon with water. Liquid and granular preparations at the rate of 5 ppmw were not effective on *C. caroliniana*. During 1961, diquat was used on a large number of weeds and was found to be effective on *P. pectinatus* and *P. foliosus* at 1 ppmw. It was effective on *P. crispus* at a rate of 2 ppmw and perhaps it would have been effective at a lower rate. Diquat appeared to be effective on *M. exalbescens* at 1 ppmw and on *Elodea canadensis* and *Ranunculus* spp. at rates of 3 to 4 ppmw. Lower rates were not tried. Diquat was not toxic to *C. caroliniana* at 3 ppmw nor to *N. flexilis* and *N. gracillima* at rates of 2 and 4 ppmw respectively. The application of diquat 50 ml (4 lb/gal) diluted to 0.5 gallon with water killed the *S. latifolia* plants within the area treated and reduced the stand of *D. americana* as much as 80 to 90 per cent. During 1958, 1959, and 1960, granular isooctyl esters of 2,4-D, liquid propylene glycol butyl ether (PGBE) silvex, and liquid 2,4,5-T were tested on many of the troublesome submerged and emergent weeds. During 1961 tests were also run using liquid preparations of mixed butyl and isopropyl esters of 2,4-D, dimethylamine salt of 2,4-D, potassium salt of silvex, granular preparations of isooctyl ester of 2,4,5-T, isooctyl ester of silvex, and potassium salt of silvex. *M. exalbescens* could be controlled with granular isooctyl ester of 2,4-D applied at a rate of 3 ppmw and with a liquid preparation of the PGBE ester of silvex, applied at a rate of 2 ppmw. Later a series of plots were prepared to determine whether liquid and granular preparations were equally effective on *M. exalbescens*. Results were inconclusive because the vegetation died from undetermined causes in areas where no herbicides were used. Other relatively isolated plots furnished evidence that mixed butyl and isopropyl esters of 2,4-D were effective at 3 ppmw. Also, dimethylamine salt of 2,4-D applied at 5 ppmw killed the *M. exalbescens* plants within the area treated. Mixed butyl and isopropyl esters of 2,4-D, PGBE esters of silvex, at rates of 50 ml (4 lb/gal) diluted with water to 0.5 gallon, and 20 per cent granular preparations of isooctyl esters of 2,4-D and silvex were effective on *Scirpus acutus*, *S. latifolia* and *D. americana* at a rate of 1 pound per 400 square feet. Granular isooctyl esters of 2,4-D, 2,4,5-T and silvex were not effective on *Ranunculus*, *C. caroliniana*, *N. flexilis*, and *N. gracillima*. Cattails, *Typha latifolia* and *T. angustifolia*, were controlled by sodium salt of dalapon and amitrole at 4 ounces and 2 ounces per gallon of water respectively, and by mixed butyl and isopropyl esters of 2,4-D at a rate of 100 ml per gallon of water. A quantity of detergent greatly improved the effectiveness of the herbicides. (Illinois Natural History Survey, Natural Resources Building, Urbana, Ill.).

Observations on the use of 2,4-D granules in fish hatchery ponds. Mackenthun, Kenneth M., Chief, Aquatic Nuisance Control. On May 23, 1961, 25-30 pounds per acre (active) of 2,4-D granules were applied to portions of three Delafield State Fish Hatchery ponds. At the time of treatment, a luxuriant growth of well developed pondweeds consisted principally of *Ranunculus* sp., *Ceratophyllum* sp., and *Potamogeton* spp. Fish were present and were not harmed as a result of the treatment. Four weeks after treatment, little change in either the untreated or treated weed population could be noted. Eight weeks following treatment, the weeds in the treated areas were down and mostly decomposed, whereas those in the control areas remained relatively unchanged from former observations. The application of 2,4-D granules at the above rates for small area control in large bodies of water throughout the state in 1961 has generally been successful. (Committee on Water Pollution, Madison, Wisconsin)

Observations on the use of disodium endothal in fish hatchery ponds. Steucke, Erwin W., Jr., Fisheries Biologist. Both liquid and granular Aquathol at 2.0 ppm were applied to three ponds, each consisting of 0.34 surface acres and containing pondweeds, water milfoil, coontail, and Chara. Fish were present and included largemouth bass, bluegill, and both adult and juvenile goldfish. Good control of weed species was noted within 7 to 14 days. No noticeable effect on either the fish population or the fish food organisms was noted, and the only chemical change of consequence was an increase in CO_2 and a lowering of the pH. A rapid knockdown of vegetation followed by slow decay did not create a dissolved oxygen deficiency. It was noted that immediately upon submersion the granules of Aquathol G became sticky and attached to the leaves and stems of the submerged vegetation. The early knockdown of pondweeds which occurred with the use of the granular form is especially desirable in fish cultural work, as a pond may be treated and drained within 3 to 4 days. (Lake Mills National Fish Hatchery, Lake Mills, Wisconsin) (Submitted by K. Mackenthun, Wisconsin Committee on Water Pollution)

The toxicology, residue, degradation, and effectiveness of disodium endothal and the dimethyl "coco" amine derivative as aquatic herbicides in fisheries habitat. Walker, Charles R. Disodium endothal and the dimethyl "coco" amine derivative have proven to be quite effective as aquatic herbicides in the Missouri studies. The results of 242 tests of disodium endothal on 18 submersed species are reported. The toxicity of these compounds to several species of fish and to the bottom dwelling, fish-food organisms is also included. Degradation of the endothal amine residues in water, bottom fauna, and fish flesh also were studied under laboratory and field conditions. Essentially, young growing stands of vegetation were most susceptible to control, and best results were achieved at water temperatures exceeding 65°F. Higher rates were required to kill plants as they reach maturity and infestations became more dense. Consistent control results were affected by plot size, wave action, turbulence, and water currents which determined the time of exposure to herbicide contact. Higher dosages were required for marginal or partial area treatments. The "coco" amine was generally more effective on filamentous algae than endothal acid although toxicity of the amine to fish was much greater. Endothal in liquid formulation was superior to granules in achieving contact action on algae mats and emergent plants. Submersed rooted infestations were controlled most effectively with granules. Bottom dwelling, fish-food organisms increased in abundance and changed in species composition following treatment of vegetation under field conditions. Bottom fauna also showed some up-take of herbicide residues but the absorption by fish was essentially negative. Degradation studies of water residues indicated the rate of disappearance to be a function of time and concentration with short duration term of persistence. (Missouri Conservation Commission, Fisheries Section, Columbia, Missouri).

Toxicological effects of several herbicides to bottom dwelling fish-food organisms in Missouri ponds. Walker, Charles R. The Missouri investigations of 1958 through 1960 considered the effects of 12 herbicides upon the bottom dwelling, fish-food organisms. The results of herbicide applications upon the quantitative and qualitative production of these organisms were studied in the plastic enclosure technique. Ecological changes in habitat were reflected in the species composition of the bottom fauna. Herbicides may cause an immediate acute toxicity, a more subtle chronic toxicity, or even a very rapid increase in numbers of certain organisms. Acute toxicity was proportional to the concentration and was a direct function of exposure time. This was further demonstrated in laboratory tests. Chronic toxicity was revealed by a gradual reduction in numbers and alteration of species composition to pollution tolerant species. Direct chemical toxicity was

not evident in those plots receiving reasonable concentrations of disodium endothal, endothal "coco" amine and simazine. Less obvious results occurred in plots treated with atrazine, monuron, polychlorobenzoic acid, and silvex. Only with applications of sodium arsenite, copper sulfate, neburon, 2,4-D and copper EDTA was the reduction in bottom fauna significant during the sampling period of a year following treatment. Although some species of bottom fauna were not completely destroyed, the more subtle effects such as change in species composition, production, and availability of food may have a profound influence on the pond ecology. (Biochemist, USDI Fish & Wildlife Service, La Crosse, Wisconsin, formerly with the Missouri Conservation Commission, Fisheries Section, Columbia, Missouri).

SUMMARY OF NEW RESEARCH FINDINGS

Prepared by the Research Committee

NORTH CENTRAL WEED CONTROL CONFERENCE

(Supplement to Research Summaries, NCWCC, 1958)

FOREWORD

The information presented in this report has been prepared by members of the Research Committee of the North Central Weed Control Conference. It is based on brief research reports submitted for publication in the 1961 Proceedings and other information.

This is the third supplement to the extensive research summaries prepared by the Research Committee in 1958. It represents findings of the 1961 season, and also includes summaries of the new work of 1959 and 1960. It is not to be construed as constituting recommendations by the Research Committee or the Conference. The report is intended as a ready source of information on recent weed control investigations for persons engaged in research, extension, regulatory, or industrial work. The 1961 reports which are reviewed are published in the NCWCC Research Report for 1961.

The use of herbicides mentioned in this report is contingent upon registration by the United States Department of Agriculture and/or establishment of residue tolerances where necessary by the United States Department of Health, Education and Welfare. In Canada, similar action is required by the appropriate governmental departments. Herbicides should be used only as recommended on the labels. Persons making recommendations for uses beyond those indicated on the label may be held liable.

The rates of application given for the various herbicides are on the basis of acid equivalent, phenol equivalent, or active ingredient, unless otherwise definitely stated.

The reports to the NCWCC were divided into 12 topics with a summarizer for each, given as authors of the summaries which follow. To them and to the many research workers who have contributed brief abstracts of their findings, we wish to express our appreciation and thanks. Without their cooperation, the preparation of this report would not have been possible.

Research Committee,
North Central Weed Control Conference
H. A. Friesen, Chairman
R. E. Nylund, Vice-Chairman

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CONTROL OF HERBACEOUS
Perennial Weeds

Lyle A. Derscheid

Johnsongrass (*Sorgum halepense* L.). Data from one experiment indicate that better control was obtained with dalapon if at least 4 applications were made during the growing season. The interval between treatments varied with the rate of application. Johnsongrass treated with $2\frac{1}{2}$ lb/A required retreatments in one week. For every additional $1\frac{1}{4}$ lb/A the interval could be lengthened one week until a maximum interval of 6 weeks was obtained. In another study the use of three surfactants failed to influence results obtained with 7.4 lb/A of dalapon and in a third study volumes of 16 to 94 gal/A of water had no influence on the effectiveness of 7.4 lb/A of dalapon.

Quackgrass or couchgrass (*Agropyron repens* L.). Data in one study indicate that TCA 120 lb/A,a CBMM 4-8 lb/sq rd , a BMM 4 lb/sq rd and sodium chlorate 8 lb/sq rd applied in June eliminated over 90% of the weed by the next spring and that erbon 100 lb/A, monuron 40 lb/A, simazine 40 lb/A eliminated 99% by the following fall (15 months after treatment). Monuron-TCA 20-100 lb/A, borax 20 lb/sq rd, sodium chlorate 59% (atlacide) 8 lb/sq rd, and a CBM 10 lb/sq rd eliminated 80 to 85% of the weed in 9-10 months, but did not improve on these results. A 5 lb/sq rd rate of a BMM, and 8 lb/sq rd rate of a CBMM eliminated 100% of the weed by the second spring. In another test, herbicides were applied to 8-inch growth and double one-way disked. Dalapon 12 lb/A and fenac 12 lb/A eliminated 92 and 88% of the weed respectively by the next spring, while simazine 12 lb/A and fenac 12 lb/A had reduced the stand 92 and 97% by the following fall. In a third experiment one-way disking after application of fenac 12 lb/A gave better kills than one-way disking before chemical treatment. Similar results were obtained with TCA in a fourth trial, which is not in close agreement with previous results. On shallow black loam soil monuron 20 lb/A maintained over 90% stand reduction for 5 years and 40 lb/A for 9 years. Rates as low as 10 lb/A have prevented crop production for 9 years.

Canada thistle (*Cirsium arvense* L.) and perennial sowthistle (*Sonchus arvensis* L. and S. *uliginosus* Bieb.). In one test ethyl ester of 2,4-D 1 1/2 lb/A, butyl ester of 4-(2,4-DB) 2 lb/A, 2-methoxy-3,6-dichlorobenzoic acid (Banvel D) 1 lb/A, amitrole 2 lb/A and amitrole-T 2 lb/A applied to Canada thistle in the bud stage gave a top knock-down, while lower rates of 2,4-D, 4-(2,4-DB) and Banvel D did not. However, only 4-(2,4-DB) 2 lb/A and the sodium salt of 4-(MCPB) 2 lb/A had any apparent effect on roots in September.

In a screening trial applied with a logarithmic sprayer minimum lethal dosages for Canada thistle appeared to be 14-21 lb/A of dimethyl amine of 2, 3, 6-TBA, 14 lb/A lithium salt of 2, 3, 6-TBA, 28-42 lb/A dimethyl amine of PBA, 15 lb/A of fenac, and 21-28 lb/A of Banvel D. For sowthistle the minimum rates for the same herbicides appeared to be 7-14 lb/A of 2, 3, 6-TBA amine, 7 lb/A Li-TBA, 42 lb/A PBA, 5 lb/A fenac, 3-7 lb/A Banvel D and 20 lb/A simazine. Amitrole-T and 2, 4-D were erratic on both species, amiben was unsatisfactory on sowthistle, and simazine was ineffective on Canada thistle.

Field bindweed (Convolvulus arvensis L.). In one test soil fumigants applied to Pullman clay loam were satisfactory. Rates of 2-6 lb/A of 3,5-dimethyltetrahydro-1, 3, 5-2H-thiadiazine-2-thione (Mylone) eliminated 100% of the bindweed and prevented seedling emergence for over 7 months. Ethylene dibromide eliminated old plants at 9 lb/A, but failed to prevent seedling emergence 7 months after application at 18 lb/A. Sodium n-methyldithiocarbamate (Vapam) 3 lb/A was ineffective.

July applications of 2.5, 5.0, 7.5, and 10 lb/A of trichlorobenzyloxyethanol, trichlorobenzylpropanol, sodium salt of fenac, ester of fenac, dimethylamine salt of 2,3,6-TBA, dimethylamine salt of PBA, amine salt of 2-methoxy-3,6-dichlorobenzoic acid and granular fenac were unsatisfactory when annual rainfall was as high as 30 inches and normal is 21. September applications of 15 lb/A of trichlorobenzylpropanol, 20 lb/A trichlorobenzylethanol, 15 lb/A of the sodium salt of fenac, 20 lb/A of an ester of fenac, 15 lb/A of an acid formulation of fenac, 20 lb/A of prometone, 40 lb/A of atrazine, and 40 lb/A of fenuron gave complete elimination while 40 lb/A of PBA and 60 lb/A of monuron gave over 90% elimination, 20 lb/A of dimethylamine salt of 2,3,6-TBA 83%, 16 lb/sq rd anhydrous borax 73%, and 5 lb/sq rd sodium chlorate 65%. Many of the same herbicides in another test gave results which indicate that minimum lethal dosages are 7-14 lb/A of dimethylamine salt of 2,3,6-TBA, 7-10 lb/A of lithium salt of 2,3,6-TBA, 28-42 lb/A of dimethylamine salt of PBA, 10-15 lb/A fenac and 7-14 lb/A 2-methoxy-3,6-dichloroacetic acid. Amitrole-T, simazine and amiben were unsatisfactory at rates of 28, 30 and 28 lb/A.

Leafy spurge (Euphorbia esula L.) and Russian knapweed (Centaurea repens L.). In a screening test applied with a logarithmic sprayer results indicated that minimum lethal dosages of several herbicides for leafy spurge were 14-20 lb/A of dimethyl amine salt of 2,3,6-TBA, 10 lb/A of lithium salt of 2,3,6-TBA, 28-42 lb/A of dimethylamine salt of PBA, 10-15 lb/A of fenac and 14-21 lb/A of 2-methoxy-3,6-dichlorobenzoic acid. Minimum lethal dosages for Russian knapweed were 21 lb/A of 2,3,6-TBA amine, 14 lb/A of Li-TBA, 42-56 lb/A of PBA, 15 lb/A of fenac and 14 lb/A of 2-methoxy-3,6-dichlorobenzoic acid. Amitrole-T, simazine and amiben were unsatisfactory at 28, 30 and 28 lb/A respectively.

Toadflax (Linaria vulgaris Mill. and L. dalmatia (L) Mill.). One year of fallow and 5 years of bromegrass eliminated these weeds. Creeping red fescue was slightly less effective. Seeds in the soil reinfested the area after the sod was plowed, but regrowth of bromegrass suppressed this reinfestation.

Field horsetail (Equiseteum arvense L.). Butyl ester of MCPA at 1/8, 1/4, 1/2 and 1 lb/A gave 89, 97, 99 and 100% top kill in 2 weeks while 1/8 and 1/4 lb/A butyl ester of 2,4-D gave only 53 and 79% top kill. None of the 2,4-D treatments reduced the stand materially, but all rates of MCPA appeared to have reduced the stand 25 to 50%. In another test 4 lb/A of amitrole or amitrole-T reduced the stand about 70%.

Abbreviations:

CBM (disodium octoborate tetrahydrate 98%)
BMM (monuron 4%, disodium pentahydrate 63%, disodium tetraborate decahydrate 31%)
CBMM (monuron 1%, sodium chlorate 40%, sodium metaborate 57%)
Monuron-TCA (monuron trichloracetate)
borax (19% boron trioxide equivalent)

CONTROL OF HERBACEOUS ANNUAL WEEDS

Robert N. Andersen

Many herbicides have been tried on many annual weed species in the last three years. A complete review of all the herbicides and weed species would duplicate much of what will be given under specific crops, and will not be attempted.

GRASSY ANNUAL WEEDS

Wild oats. During the past three years, wild oats has continued to receive more attention than have all other annual weeds. A number of compounds such as EPTC, CDAA, simazine, atrazine and trietazine have been effective in controlling this weed. However, these herbicides are injurious to the small grain crops, which predominate in the wild oats area. For this reason, two herbicides that have shown promise for use in grain crops (and some other crops) have aroused the most interest. These chemicals, barban and 2,3-dichloroallyl diisopropylthiolcarbamate (Avadex), have been widely tested in the last three years.

Barban has given generally satisfactory control of wild oats. Barban is applied as a postemergence treatment at an early stage (2-leaf stage considered optimum) in the development of the wild oats. To avoid injury to wheat and barley, it has been necessary to use rates of 1/2 lb or less per acre. Flax has shown considerable injury even at rates less than 1/2 lb/A. Sugar beets, on the other hand, are more tolerant than the grain crops and have tolerated rates in excess of 1 lb/A. One-fourth lb/A appears to be the minimum effective rate for barban. However, it appears that ideal environmental conditions are necessary for this low rate to be effective. In 1961 several formulations of barban were tested. Some of the reports suggest that a formulation designated as Lot 2A may be more effective than the present commercial formulation.

Avadex has also given generally satisfactory control of wild oats during the past three years. This herbicide must be thoroughly incorporated in the soil. Rates appear to be established at 1 to 1.5 lb/A. For the most part, studies have involved incorporation of this material before planting the crop. Recently attention has been given to shallow incorporation of the herbicide after wheat or barley have been planted. This method appears to reduce the thinning of the crops stand, which has occured when wheat or barley are seeded in treated soil. Flax and sugar beets are quite tolerant to Avadex and may be seeded in treated soil. In 1961 an analogue of Avadex, 2,3,3-trichloroallyl diisopropylthiolcarbamate (CP 23426), was compared to Avadex in some of the tests reported. CP 23426 may be more effective in controlling wild oats, and may be less injurious to small grains, than is Avadex.

Foxtails (<u>Setaria</u> spp.). Several herbicides including dalapon and TCA in postemergence treatments; EPTC in soil-incorporation treatments; and TCA, CDAA, simazine, atrazine, and amiben in preemergence treatments; have been effective on these weeds.

Crabgrass (<u>Digitaria</u> spp.). Several new herbicides have shown much promise for control of this weed, particularly in lawns. Consult the turf section of this report.

BROADLEAVED ANNUALS

Wild buckwheat (*Polygonum convolvulus* L.). Barban at early stages of growth; 2-methoxy-3,6-dichlorobenzoic acid; isomeric mixtures of MCPA and 2,4,5-T; iso-octyl ester of 2,4-D; a mixture of various 2,4-D esters with 2,3,6-TBA or diquat; and high rates of MCPA have all been reported as effective on this weed.

Tartary buckwheat (*Fagopyrum tataricum* (L.) Gaertn.). Iso-octyl and butoxy ethanol esters of 2,4-D; 2-methoxy-3,5,6-trichlorobenzoic acid; and mono-*N*,*N*-dimethylcocoamine salt of endothal have been effective on this weed.

Russian thistle (*Salsola kali* L. var. *tenuifolia* Tausch). Atrazine at rates higher than needed for the control of most annual weeds and 4-(2,4-DB) have shown promise. Of 18 herbicides tested in 1961, 2-methoxy-3,6-dichlorobenzoic acid was the most promising.

Rough pigweed (*Amaranthus retroflexus* L.). Atrazine; 4-(2,4-DB); 2-methoxy-3,6-dichlorobenzoic acid; and various forms of 2,4-D have been effective.

Prostrate pigweed (*Amaranthus graecizan* L.). Atrazine; prometone; and 4-(2,4-DB) have been effective. Satisfactory control has been obtained with 2,4-D at 4 lb/A, but only poor control at 2 lb/A.

Purslane (*Portulaca oleracea* L.). Some of the triazines, and a mixture of chlorinated benzoic and cresoxyacetic acids have been among the most promising herbicides reported.

Green smartweed (*Polygonum scabrum* Moench.). In one study in 1961 involving 18 herbicides, 2-methoxy-3,6-dichlorobenzoic acid was outstanding with 100% control at 1 lb/A.

Ladysthumb (*Polygonum persicaria* L.). Neburon and 2,3,6-TBA have shown promise for controlling this weed.

Corn spurry (*Spergula arvensis* L.). 2-(MCPP); 2-methoxy-3,6-dichlorobenzoic acid; and a mixture of chlorinated benzoic and cresoxyacetic acids gave excellent control in 1961.

Scentless mayweed (*Matricaria inodora*). In 1961, 2-(MCPP) controlled this weed with no apparent effect on bromegrass.

Cow cockle (*Saponaria vaccaria* L.), nightflowering catchfly (*Silene noctiflora* L.), and largeseed falseflax (*Camelina sativa* (L.) Crantz). Of 18 herbicides tested on these three species in 1961, none gave satisfactory control.

WEED CONTROL IN CORN, SORGHUM AND SOYBEANS

D. D. Bondarenko

Corn. Numerous compounds were evaluated as herbicides on corn during the period 1959-61. A few of them gave satisfactory results consistently. The greatest interest was centered on the triazine compounds atrazine and simazine.

Atrazine and/or simazine were included in most of the reports on corn during this three-year period. Generally the results with these herbicides were similar. Both usually controlled annual weeds the entire growing season where applied preemergence at 2 lb/A. Slightly higher rates were needed on soils high in organic matter. Perennial weeds, except some species germinating from seed, were generally not controlled by these herbicides applied preemergence.

Atrazine and simazine, like other preemergence herbicides, worked best where they were applied on a smooth seedbed and moderate rain followed before germination of the weed seeds. Atrazine seemed to require less moisture than simazine to work well. The effectiveness of these herbicides as weedkillers was changed little or none by heavy rains.

Generally neither atrazine nor simazine damaged corn, even on sandy soil where heavy rains followed within a few days after application. At least one investigator reported damage to corn following preemergence treatment by 2,4-D, EPTC, 2,4-DEP and fenac.

One report indicated no damage to 27 corn inbred lines following treatment by atrazine preemergence at 3 and 9 lb/A.

Atrazine and simazine soil residual caused some concern. Interseedings made at layby in corn treated by these herbicides were severely injured. Band application reduced the damage, but the spray droplets (and fine granules) drifted to also kill some of the seeding between the intended bands. In a few situations, atrazine and simazine damaged to varying degrees wheat, barley, oats and soybeans following treated corn.

Atrazine, simazine and other preemergence herbicides were compared in the spray and granular formulations on corn. Generally weeds were controlled as well by one formulation as the other, and the effect on the corn was not changed. The author and other workers believed that generally where differences in results with sprays and granules occurred, faulty application was to blame. However, the sprays usually gave better results than the granules on rough seedbeds.

Atrazine applied early postemergence usually gave good control of annual weeds without damaging the corn. Many other triazine compounds were evaluated as herbicides on corn but were less satisfactory than atrazine and simazine.

The advantages and limitations of 2,4-D as a preemergence and postemergence herbicide were discussed previously and will not be included in this supplement. One report indicated that a directed postemergence spray of 2,4-D plus dalapon showed promise where annual broadleaf and annual grass weeds were a problem in corn.

CDAA-T (CDAA plus triclorobenzyl chloride) preemergence gave erratic control of annual weeds, ranging from excellent to poor. However, it continued to be superior to CDAA primarily because of better control of annual broadleaf weeds. CDAA-T was less hazardous than 2,4-D and did not present a soil residual problem.

Numerous other compounds were evaluated as herbicides on corn. EPTC, fenac, 2,3,6-TBA and other substituted benzoics, 2,4-DEP, 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea and a few others showed promise but usually were not as satisfactory as atrazine and simazine.

Sorghum. Many compounds were evaluated as preemergence herbicides on sorghum in 1959 through 1961. None gave consistently satisfactory results in the North Central Region.

In Nebraska, where preemergence herbicides satisfactorily controlled weeds, the yield of the sorghum was equal to that of hand weeded plots. Maximum yield in both herbicide treated and hand weeded plots was obtained with two cultivations.

Herbicides that gave satisfactory results as preemergence treatments in one or more experiments on sorghum included amiben, atrazine, atrazine or propazine plus CDAA, CDAA-T, neburon, PCP, propazine, 6-nitro-2,4-dichlorophenol, 3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea and 2-chloro-4-isopropylamino-6-methylamino-*s*-triazine.

Good cultural practices supplemented by 2,4-D postemergence appeared to be one of the most satisfactory methods of controlling weeds in sorghum. Tolerance of sorghum to 2,4-D appeared to be dependent on variety and possibly on stage of growth. However, the response of sorghum at different stages undoubtedly was a manifestation of the rate of the basic plant processes as they were affected by the environment.

Soybeans. Amiben preemergence gave the most consistently satisfactory results in soybeans during the years 1959-61. Usually amiben gave excellent full-season control of most annual broadleaf and annual grass weeds when applied at the suggested rate of 3 lb/A. Little or no damage to beans followed treatment at this rate or higher. Where slight damage followed treatment at a higher rate, recovery was complete.

Amiben, like other preemergence herbicides, worked best where it was applied on a smooth seedbed and moderate rain followed before germination of the weed seeds. Combinations of amiben and other herbicides showed little or no advantage over amiben alone.

One report indicated less amiben was needed to obtain satisfactory weed control in narrow-row soybeans, due to fewer weeds as a result of more competition from the beans, than in wide-row beans when treated overall and no cultivation followed. The quantity of herbicide needed per acre probably would have been the same if it were applied in bands since less area per acre is treated in wide-row beans.

A combination of NPA and CIPC usually gave better results than either component applied alone at the suggested rate. This mixture was especially useful where smartweed, pigweed, and common ragweed were among the annual weeds to be controlled, since CIPC readily controlled smartweed but was rather ineffective on pigweed and common ragweed, with the reverse true of NPA.

PCP alone and in combination with CDAA usually gave good results. One report stated weed seeds germinated six weeks after PCP treatment.

CDAA usually gave good control of annual grasses but poor control of annual broadleaf weeds.

Several triazine compounds appeared promising as herbicides on soybeans. However, some of them had a rather narrow margin of safety.

Many other compounds were tested as herbicides on soybeans. None appeared as satisfactory as amiben, but some may show more promise with additional testing.

Due to the limitations of DNBP postemergence on soybeans, it appeared this treatment was warranted only in emergency. No other postemergence herbicide appeared promising.

WEED CONTROL IN SMALL GRAINS

J. J. Sexsmith

During the past three years the major interest has been wild oat control, and in 1961 all reports dealt with this one subject. An interesting feature of the reports has been the change in rates of the various chemicals under test, the trend being to a lowering of the application rates so that a more favorable balance between wild oat control and crop injury was obtained.

Avadex (2,3-dichloroallyl diisopropylthiolcarbamate) was first reported as useful for the control of wild oats as a preplanting, incorporated treatment. The most recent reports detail results from a variety of types and means of incorporation, both before and after seeding. The results indicate that good wild oat control and minimum crop injury were obtained by any method that gave a thorough incorporation to a uniform depth of from 1 to 3 inches, crop seeding being below the depth of incorporation whether incorporation was done before or after seeding. Acceptable treatment rates vary with the crop concerned, being between $1\frac{1}{2}$ and 2 lb/A for flax, 1 and $1\frac{1}{2}$ lb/A for barley, and near 1 lb/A for wheat. Delayed seeding of wheat and barley (up to 18 days) after Avadex treatment caused no difference in the effects of the herbicide on crop stands or yields. Differences in varietal tolerance have been found in wheat and barley, Selkirk and Chinook spring wheat, Ramsey durum wheat, and Huskey, Montcalm, and Parkland barley being the most susceptible varieties of those tested. CP 23426, a compound that is chemically related to Avadex, was reported to cause slightly less injury to wheat and barley while giving essentially equal control of wild oats.

Barban (Carbyne) has no effect when applied before wild oat germination, but as a postemergence treatment has given wild oat stand reductions of up to 70% and a noticeable delay of surviving plants. Applications at rates ranging

from 4 to 12 oz/A have given good results only when applied to wild oats in the $1\frac{1}{2}$- to 2-leaf stage and when the crop provided some degree of competition. Applications at later stages of wild oat growth were reported to cause more injury to the barley, wheat, and flax crops. Some minor varietal differences in tolerance to Carbyne of the small grains have been reported, but differences have not been completely detailed. No consistent differences have been reported from tests comparing the use of cone- and fan-type nozzles for application of Carbyne. The "2A" formulation of barban (Carbyne) was reported to be superior to the standard material for wild oat control, both at the accepted treatment stage and at the 2- to 4-leaf stage of wild oat growth.

Early fall tillage (i.e., late September or early October) was shown to be more effective in controlling wild oats than was late fall or early spring cultivation.

EPTC, amiben, and Casoron (2,6-dichlorobenzonitrile) were tested during the 1959-1961 period, but none has been considered worthy of more complete assessment because of poor weed control or excessive crop injury and yield reduction.

Reports on the control of Canada thistle, perennial sowthistle, wild buckwheat, green and yellow foxtail, and darnel in small grains did not include any promising new developments.

CONTROL OF WEEDS IN OTHER FIELD CROPS

M. K. McCarty

<u>Forage legumes</u>. Phenoxyacetic and phenoxybutyric materials alone and in combination with dalapon continued to give good results as postemergence treatments. EPTC liquid and granular formulation comparisons revealed little or no difference in effectiveness. Incorporating either material into the soil prior to planting gave better results than preemergence or postemergence use. Sweetclover sustained considerable injury from preemergence use of trietazine and EPTC and postemergence use of trietazine and 4-(2,4-DB). Amiben as a preemergence treatment reduced stands of red clover, alfalfa, birdsfoot trefoil and alsike clover, in that order. Madrid and Hubam sweetclover, with and without oats, were given preemergence treatment with 1, 2 and 4 lb/A amiben. Good weed control was obtained at the heavier rates of amiben with no damage to the sweetclover. Sweetclover caused a small but significant decrease in oats yield and oats caused a 13-14 fold reduction in sweetclover yields. Diphenamide (<u>N</u>,N-dimethyl-2,2-diphenylacetamide) as a preemergence application at 2, 4, and 8 lb/A on alfalfa gave good control of barnyardgrass and fall panicum but did not control common ragweed. Alfalfa stands were reduced about 10% at the 4 lb rate and 50% at the 8 lb/A rate.

<u>White beans</u>. 2,3-Dichloroallyl diisopropylthiolcarbamate (Avadex) at 1.5 and 2 lb/A and CP 23426 (2,3,3-trichloroallyl diisopropylthiolcarbamate) at 1.5 lb/A preplanting and barban at 12 oz/A when wild oats were in the 2 leaf stage, gave good control of wild oats with no control of green foxtail. Bean yields averaged less than 1/2 that of the weeded check.

<u>Sugar beets</u>. Avadex, propyl ethyl-n-butylthiolcarbamate (Tillam), CDEC, CDAA, EPTC, variously substituted endothal salts and other herbicides were reported with weed control varying from poor to excellent. EPTC and Tillam granules were reported as more effective on yellow nutsedge than the same rates of liquid formulation. Preplanting application of Avadex at 1 1/2 to 2 lb/A gave good to excellent control of wild oats. Various methods of incorporating the herbicide in the soil were employed. IPC and TCA gave some stand reduction or injury at higher rates reported.

<u>Castorbeans</u>. One abstract reported 24 treatments utilizing 13 herbicides. Those that showed promise for use in castorbeans were amiben, 2,6-dichlorobenzonitrile (Casoron), CDAA, EPTC, NPA, and O,2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate (Zytron).

<u>Flax</u>. Various phenoxy compounds and N-(3,4-dichlorophenyl)methacrylamide (Dicryl) were compared for weed control in flax. 2,4-D at 4, 6 and 8 oz/A and 4-(2,4-DB) at 8, 12 and 16 oz/A gave the best control of Russian thistle and pigweed and the best yields of flax. A comparison of 5 formulations of the butyl ester of 2,4-D showed no differences among formulations. Avadex from 1 to 2 lb/A gave varying degrees of control of wild oats depending on the method of incorporation in the soil and lapse of time between application and incorporation. Effectiveness was apparently reduced when incorporation could not be done on the same day the material was applied. Effectiveness was also reduced when the incorporation method stirred the soil too deeply. TCA and dalapon at low rates mixed with phenoxyacetics gave good control of foxtail. Yields on treated plots were still somewhat lower than those on weeded checks.

<u>Pasture</u>. New seedings of bromegrass and crested wheatgrass treated at 2-4 inch height with 2 lb/A mixed amines of 2,4-D, butyl ester of MCPA and Na salts of 4-(2,4-DB) and 4-(MCPB) showed no significant damage. 2,4-D at 2 lb/A and 2,3,6-TBA at 4 and 8 lb/A applied in early spring on Kentucky bluegrass being used for seed production, significantly reduced yield. NPA at 8 lb/A and neburon at 4 lb/A as fall treatments increased the yield of seed over check. Sideoats grama seedlings treated with 1/4, 1/2, and 1 lb/A of the PGBE ester of 2,4-D when grass was 3 inches tall, 8 inches tall, in the boot stage, and fully headed showed no effects on maturity, forage production or seed production.

Four cool season grasses were treated with 2,4-D and 4-(2,4-DB) at 3 and 6 weeks following emergence in the greenhouse and 2,4, and 6 weeks following emergence in the field. Slight to moderate damage occurred at the first date in each case with no apparent damage at the 6-week date. Kentucky bluegrass showed the most damage, orchard grass next, with timothy and tall fescue the least. Big bluestem seeded in rows for seed production was given preemergence treatment with herbicides for control of weeds. None of the treatments gave season-long control. 2-Methoxy-3,6-dichlorobenzoic acid (Banvel-D) gave good control of broad-leaved weeds. Atrazine and 2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine (Atrametryne) gave good control of broad-leaved weeds and early control of grasses. A stand of fall panicgrass developed in late summer. None of the treatments appeared to hurt the big bluestem.

<u>Processing peas</u>. IPC, EPTC, Avadex, trietazine and barban all gave some injury ranging from slight stunting in barban at 1 lb/A to stand thinning with EPTC at 3 lb/A. In another test, EPTC appeared to give the best control of both broad-leaves and grasses, with only slight damage to the peas. Amiben

at 2 and 4 lb/A, diuron at 2 lb/A and trietazine at 4 lb/A gave satisfactory weed control. Dacthal at 6 and 12 lb/A and Casoron at 2 and 4 lb/A did not give satisfactory weed control. Comparisons of phenoxyacetics and phenoxybutyrics varied from year to year as to effectiveness and relative damage. However, in one test, Tropotox Plus (15:1 mixture of sodium salts of 4-(MCPB) and MCPA) gave better weed control than the butyric material while causing slightly more visible injury to the pea crop.

Potatoes. Several substituted triazines at 4 lb/A and DNBP and N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solan) at 6 lb/A were applied to potatoes. All treatments reported gave season-long weed control with no injury to the potatoes or reduction of yield when used preemergence but the triazines severely injured potatoes and decreased yields when used postemergence.

Rapeseed. Avadex at 1 1/2 to 2 lb/A gave 95% control of wild oats. Effectiveness was greater when applied in 8.4 gal/A water than in 4.2 gal/A. Delaying incorporation into soil for 8 days reduced effectiveness 25%. There was no damage to the rapeseed at any of the rates used. Where Avadex gave good control in 1959, wild oat populations were much reduced in 1960 as compared to adjacent untreated area.

Tobacco. EPTC and trietazine as preplanting treatments at 3 lb/A gave fair to good weed control with slight damage. EPTC and trietazine applied postplanting gave about the same weed control but slightly more crop damage. Casoron, amiben and Dacthal gave good weed control but moderate to severe crop damage particularly where Casoron in granular form was incorporated and Dacthal at the higher rates.

Other crops. Barban at 1 lb/A gave fair to good suppression of wild oats when applied 17 days after seeding in a 13 crop trial. No injury to potatoes, cucumbers, carrots, table and sugar beets, and commercial yellow mustard; very slight injury to peas, beans, barley and sunflower; slight to moderate injury to Redwood flax and Golden Seneca corn; and moderate injury to Thatcher wheat were observed. Avadex at 1 1/2 and 2 lb/A and CP 7667 (2-chloroallyl diisopropyldithiocarbamate) at 2 and 4 lb/A were applied to the same crops as preplanting treatments. Neither treatment gave any control of broad-leaved weeds but Avadex gave good control of wild oats. There was little difference in injury rating (listed as none to slight) at the higher rates of the two herbicides on potatoes, cucumbers, carrots, red and sugar beets, mustard, flax, sunflower or corn. Nineteen crops of potential industrial usefulness were rated for tolerances to preemergence sprays of CDAA at 4 lb/A, and EPTC, amiben and propazine at 3 lb/A. Only *Sorghum almum* showed tolerance to propazine and only *Rudbeckia bicolor* and *Brassica campestris* showed more than slight susceptibility to CDAA. Reactions to EPTC and amiben ranged from tolerant to susceptible.

WEED CONTROL IN HORTICULTURAL CROPS

D. D. Hemphill

Flowers. Post-planting treatments of monuron 1 lb/A, diuron 1 lb/A plus sesone 3 lb/A, 2,4-DEP, and 2-chloro-4-diethylamino-6-isopropylamino-s-triazine (ipazine) in chrysanthemums gave excellent weed control with apparently no crop damage.

Fruit. Amitrole, diuron and simazine are effective for the control of weeds beneath young, non-bearing as well as bearing, apple trees. Amitrole is effective in the control of established weeds, while diuron and simazine give residual control. Amitrole is not approved for use beneath bearing apple trees from the time of fruit set until time of fruit harvest.

Atrazine 5 lb/A, amizine (mixture of amitrole and simazine) 10 lb/A, and prometone 12 lb/A were successful in controlling annual weeds and quackgrass under established young nonbearing cherry trees with no apparent injury to the trees.

Trietazine 4 lb/A and simazine 2 lb/A applied to a planting of several varieties of raspberries before resumption of growth in the spring, and trietazine 2 lb/A, simazine 2 lb/A and N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solan) 6 lb/A applied as a basal spray after growth had begun, gave season long weed control without apparent injury. In another experiment on a loessial silt loam soil, simazine 4 lb/A applied as a basal spray after growth had begun, caused severe chlorosis on red, purple and black varieties. Diuron 2 lb/A applied before resumption of growth in the spring to several varieties of upright blackberries reduced weed populations markedly without apparent injury.

In strawberry plantings, dimethyl-2,3,5,6-tetrachloroterephthalate (Dacthal) has shown considerable promise for use in first and second year plantings. Simazine and 2,5-dichloro-3-nitrobenzoic acid (Dinoben) has caused foliage injury, stunting and reduced runner production. Trietazine and Solan may give injury at rates necessary for satisfactory weed control. EPTC, CDAA and 2,4-DEP have shown promise for use in first and second year plantings but have not been more satisfactory than sesone.

Turf. In most instances, effective preemergence control of crabgrass in bluegrass turf without serious turf injury has been obtained with dimethyl-2,3,5,6-tetrachloroterephthalate (Dacthal), O-(2,4-dichlorophenyl) O-methyl isopropylphosphoramidothioate (Zytron), N,N-di-n-propyl-2,6-dinitro-4-methylaniline (Dipropalin), chlordane, calcium propyl arsonate, diphenylacetronitrile (Diphenatrile) and polychlorodicyclopentadiene isomers (Bandane). These same herbicides have been used effectively on bent and bermudagrass golf greens. Calcium arsonate is effective in crabgrass control, but may thin bluegrass turf under drought conditions. N,N-dimethyl-2,2-diphenylacetamide (Diphenamid) and N,N-di-n-propyl-2,6-dinitro-4-trifluoromethylaniline (Trifluralin) have given serious turf injury. Dacthal and Zytron have been most consistent in effective performance. Calcium propyl arsonate appears most effective as an early postemergence application.

Various formulations of arsonates continued to give the most effective postemergence control of crabgrass.

Satisfactory selective control of weeds such as nimblewill, nutsedge, bermudagrass and tall fescue in bluegrass turf has not been achieved.

Endothal has shown some promise for the control of knotweed and Veronica spp.

Vegetables. Since 1958, several new herbicides have been evaluated for use in vegetable crops. Amiben shows promise as a preemergence treatment in snap and lima beans, carrots and cucurbits, and as a posttransplanting treatment in cabbage, sweet potatoes and tomatoes. Atrametryne (2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine) was effective in preemergence treatments of peas. Atrazine appears equally as satisfactory as simazine in sweet corn. 2,6-Dichlorobenzonitrile (Casoron) shows possible use in snap beans, transplanted cabbage and tomatoes and as a layby treatment in onions. Dacthal (dimethyl 2,3,5,6-tetrachloroterephthalate) has given good results as a preemergence treatment in snap and lima beans, onions, potatoes and as a post-transplanting treatment in cabbage. Diphenamid (N,N-dimethyl-2,2-diphenylacetamide) has been reported to show promise as a preemergence treatment in asparagus, beets, cabbage, cucurbits, peas, onions and potatoes. Dicryl (N-(3,4-dichlorophenyl)-methacrylamide) shows promise for either pre- or postemergence selective use in carrots and parsnips. Karsil (N-(3,4-dichlorophenyl)-2-methylpentanamide) shows promise for both preemergence and postemergence treatments in carrots. Prometryne (2,4-bis(isopropylamino)-6-methylmercapto-s-triazine) has given favorable results as a preemergence treatment in peas and as a postemergence treatment in cabbage and carrots. Propazine has been reported to show promise for preemergence use in carrots and celery. Solan has given favorable results as a postemergence or post-transplanting treatment in carrots, celery, parsnips and tomatoes. Trifluralin (N,N-di-n-propyl-2,6-dinitro-4-trifluoromethylaniline) is very effective in weed control and has shown promise as a preemergence treatment in snap beans and peas. Zytron (O-2,4-dichlorophenyl O-methyl isopropylphosphoramidothioate) has given favorable results as a preemergence treatment in onions and as a post-transplanting treatment in cabbage. DuPont 326 (3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea) has been reported to show some promise as a preemergence treatment in snap beans, carrots, sweet corn and peas, and as a postemergence treatment in carrots.

FORESTRY, ORNAMENTAL NURSERIES, AND SHELTERBELTS

WEED CONTROL IN ORNAMENTAL AND FOREST NURSERIES AND PLANTINGS

J. E. Kuntz and L. G. Holm

Herbicides already have provided a valuable silvicultural tool in several different phases of forest management. Herbicides are used to eliminate undesirable "weed" trees from forest stands; to maintain firelanes, access roads, utility lines, drainage ditches, mill yards, and pulpwood storage areas; to weed ornamental and forest tree nurseries; to reduce weed competition to new forest plantings, Christmas tree plantings, windbreaks, shelterbelts, and game food plantings; to control forest tree diseases; and to debark trees. So far, major attention has been given the testing of new materials for specific purposes in the field as well as the development of improved methods of application. Much more fundamental information is needed regarding effective chemicals,

their mode of action upon plants and soil microorganisms, their movement and persistence in different soils under different conditions, and their effects on trees of different species, ages, and planting schedules before and after treatment.

Although few research reports have appeared in 1959, 1960, and 1961, problems of weed control in tree nurseries and especially in field plantings have received increasing attention -- both by researchers and by commercial growers. Several new herbicides have shown promise. Recent trends are summarized.

Field plantings. New tree plantings have generally been treated at the time of planting. Herbicides such as simazine, atrazine, other triazines, dalapon, monuron, diuron, and amitrole, alone and in combination, were usually applied in bands to scalped rows just ahead of the planting shoe. Results have varied with dosage, rainfall, soil type, and weed species. Accurate sprayer calibration and correct dosage application constitute serious problems, especially for the commercial operator. Frequently, effective weed control has provided greatly increased survival and growth rates. Often combinations of an herbicide giving quick kill with one giving lasting effects have been most effective. In test plantings, insects (as white grubs), diseases (as stem rusts and foliage blights), animals (as mice, rabbits, and deer), and fire frequently destroy many trees; hence, their control may also be essential to avoid error where a critical evaluation of tree response to herbicide is desired.

Older plantings, overgrown and suppressed by weeds and especially grass, have challenged new materials and methods of application. Special precautions in the choice of herbicides and in the time and rate of application must be taken with overall foliage sprays because of the danger of contact injury. Treatments with certain triazines, including simazine and atrazine, alone or in mixtures with amitrole or dalapon, have shown promise. Amitrole and dalapon have caused less injury when applied to dormant rather than to actively growing conifers. Low rates of monuron and diuron, either alone or in combination, have proved effective, especially on heavier soil types. Granular preparations, even at relatively high rates, have failed to give satisfactory control of established weeds. Simazine, atrazine, prometone, and a mixture of 15 per cent amitrole with 45 per cent simazine have been used experimentally to eradicate established quack grass around apple trees. Herbicides containing TCA have injured, to varying degrees, both conifers and hardwoods.

Nurseries. Attention to weed control in seedling and transplant beds has continued. Easier and more effective techniques of application have renewed interest in soil fumigants. Spectacular results in seedling stand and vigor no doubt reflect control of detrimental soil microorganisms and nematodes, as well as weeds. More lasting weed control has been sought with new herbicides. Preemergence treatments with simazine, atrazine, and propazine caused no reduction in pine seed germination and emergence, but produced severe injury of young seedlings. Postemergence, overall treatments caused variable injury to young seedlings, less injury to seedlings two months old, and little or none to transplants. Seedlings of both conifers and deciduous species reacted differently to triazines. For example, in seedbeds of Colorado blue spruce and Scotch pine growing on a clay soil, simazine at 1 lb/A and propazine at 2 lb/A gave effective weed control. Simazine, but not propazine, drastically reduced seedling stand. Preemergence treatments with simazine

and monuron of caragana seedbeds also caused high seedling mortality. Simazine at 2 lb/A and above gave excellent weed control in 3-year-old Colorado spruce, white spruce, and Scotch pine transplant beds, but caused considerable injury to white spruce and Scotch pine. Propazine at 4 lb/A gave satisfactory weed control and no appreciable damage to trees. Such variations demand careful attention. Simazine and propazine persisted in treated layers of nursery soil even after heavy leaching. Surface applications of EPTC in liquid or granular form also have given good weed control with little, if any, adverse effects on the majority of tree species tested. Granular EPTC, worked into the soil, has caused some injury to emerging red pine seedlings. Recently, preemergence and postemergence applications of dimethyl 2,3,5,6-tetrachloroterephthalate (Dacthal) to red pine seedbeds have shown promise.

Chemical weed control in ornamental and forest nurseries poses several unique problems. Weed control in nursery crops is complicated not only by the diversity and number of plant genera, species, and cultivars, but also by the variation in the age of plants at the time of treatment. The fact that slow-growing nursery stocks may remain in the same beds for several years enables annual weeds to multiply by repeated seedings and perennial weeds to invade the area.

Certain precautions must be taken. Nurseries frequently are located on light, sandy soils. In such situations, not only is the margin of safety low for the use of herbicides, but also the danger exists of toxic residues from repeated applications. Generally, the same land is used over and over with a minimum of crop rotation. Hence, every effort should be made to maintain the most favorable growing conditions.

Although nursery weed control must be approached cautiously and with an understanding of the complicating factors, there is much to favor the use of chemicals in nursery plantings. The high crop value makes it economically feasible to use chemicals for weeding. The limited areas permit intensive management under the most favorable, controlled conditions. Very specialized and even complicated treatments where timing is critical are possible with one or several herbicides, alone or in mixtures. Where available, overhead irrigation systems provide a ready means of application for some herbicides as well as effective moisture control.

Disease control. The control of certain forest tree diseases constitutes a somewhat unique, though an important, use of herbicides. Infectious tree diseases, as well as those of most other plants, are controlled mainly by measures designed to prevent either the spread of the inciting agents or the initial infection of the host. For example, several rust diseases kill forest trees or limit their growth and productivity. By eradicating nearby alternate hosts which are necessary for the completion of the life cycle of the respective fungus pathogens, the more valuable trees are protected from infection. Effective disease control programs based on this principle include the protection of 5-needled pines from white pine blister rust by *Ribes* eradication and the protection of cultivated and ornamental apples from cedar apple rust by elimination of red cedars. In all these problems, the use of herbicides has replaced laborious and costly hand eradication methods.

Herbicides also have played an important role in preventing or reducing the spread of oak wilt. Silvicides have been used to treat infected oak trees to hasten their death, decortication, and desiccation. Fungus mats, which serve as sources of inoculum for long distance spread of the fungus, seldom form on such treated trees. The oak wilt fungus also spreads from tree to tree in local areas through underground root grafts. In woodland areas, where individual trees are of relatively low value, poisoning healthy oaks bordering a wilt-infected pocket has prevented further spread. Sodium arsenite, injected into the root collar or buttress roots of trunk-girdled trees, has proved especially effective. Less toxic herbicides, such as AMS, 2,4-D or 2,4,5-T, also have been used with variable results. More recently, killing portions of connected roots with soil gumigants has provided another means of control, especially for trees in lawns and parkways. Neither dyes, poisons, nor the oak wilt fungus passed through sections of roots killed by injections of methyl bromide or SMDC in sandy soil between healthy and inoculated oak trees. Although injections with soil fumigants of heavier soils have killed smaller sections of roots, in most cases, fungus spread has been prevented. Similarly, such herbicidal treatments may provide control of spread of the Dutch elm disease fungus through elm root grafts.

BASIC STUDIES IN BOTANY, ECOLOGY AND PLANT PHYSIOLOGY

R. Behrens

A total of eleven abstracts were submitted to this section during the 1959-61 period. They were concerned with greatly diverse subjects.

Radioactivity was found in the nectar of several species after foliar applications of C^{14} tagged amitrole and 2,4-D. Bees foraged on plants treated with a number of herbicides and fed on sugar water containing fairly high concentrations of a number of herbicides without serious mortality. These tests indicate a possibility of herbicide contamination of honey.

Atrazine and simazine residue levels were approximately the same 10 months after application in one test.

The inhibition of alfalfa growth by quackgrass residues was found to be due to a widening of the soil carbon to nitrogen ratio rather than an effect of toxic substances from the quackgrass rhizomes.

The great reproductive potential of yellow nutsedge, *Cyperus esculentus*, was reported and the presence of a germination inhibitor in nutgrass tubers was demonstrated.

Wild oat seed dormancy was found to be greater for brown-hulled seed and for varieties producing brown-hulled seed. Barban caused complete suppression of the root and shoot growth of wild oats at very low concentrations when applied to germinating seeds as an aqueous solution and its use was suggested for studies involving soil treatments.

Foliage treatments of Thatcher wheat with (2-chloroethyl)trimethylammonium chloride (CCC) reduced plant height, and delayed maturity without affecting yield.

NEW HERBICIDES

P. C. Hamm

The following summary is based on results reported on new chemicals tested in 1961. Only the more recently introduced compounds have been included. For clarification and simplicity the common name, trademark or code number is indicated in parenthesis following the chemical nomenclature.

2-Methoxy-3,5,6-trichlorobenzoic acid (Banvel-T). One reported preemergence use in corn at 1 and 4 lb/A gave 57 and 93% weed control respectively with no corn injury. One reported postemergence study in 4-5 leaf stage of barley at 1/2, 1 and 2 lbs. per acre provided 4, 50 and 95% control of seedling corn spurry. Barley was injured at all rates. One reported use in wheat reported good control of tartary buckwheat and 60% yield increase for crop.

Tests on specific weed species (no crop) at 1 lb/A provided 37% control of green smartweed, 29% control of rough pigweed, 21% control of night flowering catchfly, 17% control of cow cockle and 92% control of tartary buckwheat.

2-Methoxy-3,6-dichlorobenzoic acid (Banvel-D). Preemergence. Three trials reported in corn - 1/2 to 2 lb/A. General weed control 25 to 88%. Grass weed control 0 to 30%, broadleaf weed control 30 to 100%. Corn injury 0 to 13%. One trial reported in flax - 1/2 to 1 lb. reported moderate control of Russian thistle and excellent control of rough pigweed and moderate injury to flax at both rates.

Postemergence sprays were reported for several troublesome weed species:

	% Control	Rate lb/A			
Cow cockle	12-21	1/2 to 1			
Corn spurry	53-97	1/2 to 1			
Rough pigweed	75-100	1/2 to 1			
Night flowering catchfly	8-33	1/2 to 1			
Russian thistle	75-92	1/2 to 1			
Tartary buckwheat	79-100	1/2 to 1			
Large seeded falseflax	5-20	1/2 to 1			
Russian knapweed	0-100	3 1/2	Treatment	Date	Critical
Russian knapweed	20-100	7	"	"	"
Russian knapweed	99-100	14			
Big bluestem	0	2-4			
Leafy spurge	0-100	3 1/2	"	"	"
Leafy spurge	50-100	7	"	"	"
Leafy spurge	75-100	14	"	"	"
Field bindweed	0-100	3 1/2	"	"	"
Field bindweed	70-100	7	"	"	"
Field bindweed	100	14			
Perennial sow thistle	95-100	3 1/2			
Perennial sow thistle	99-100	7			
Canada thistle	100	Tops 1/2 to 1 1/2			
Canada thistle	50-75	3 1/2	Treatment	Date	Critical
Canada thistle	80-85	7	"	"	"
Canada thistle	90-99	14			

N-(3-chloro-4-methylphenyl)-2-methylpentanamide (Solan). Reported ineffective for preemergence weed control in peas at 4 lb/A. Reported 100% weed control pre or postemergence applications in parsnips. Slight injury to parsnips at 4 and 6 lb/A. Reported 100% weed control from postemergence applications in carrots. No crop injury at 3 and 6 lb/A.

Reported 80% weed control from postemergence application in strawberries. Slight crop injury at 4 lb/A. One hundred percent weed control reported in post transplant celery at 4 lb/A. No injury reported. Season long weed control reported from pre and postemergence applications in potatoes at 6 and 4 lb/A respectively. No injury to crop from preemergence spray. Severe injury with postemergence spray.

Eight lb/A Solan applied preemergence to tomatoes proved third best of 27 herbicides for weed control. One lb Solan applied each of four weeks as spray to tomato transplants provided excellent weed control and no crop injury. Two applications of 2 lb/A proved ineffective as did one application of 4 lb/A.

3-(3,4-Dichlorophenyl)-1-methoxy-1-methylurea (M-326 or DP-326). Provided effective preemergence weed control at rates of 1 to 3 lb/A. Soybean stands were reduced at all rates. Corn was injured slightly at 3 lb. Peas, snapbeans, carrots and squash reported uninjured up to 3 lb. Postemergence sprays reported promising only on carrots - one fourth to 3 lb/A. Beets, cabbage, onions and strawberries were injured.

N,N-dimethyl-2,2-diphenylacetamide (Diphenamid). Provided satisfactory to excellent preemergence weed control at rates of 4 to 10 lb/A for peas, snapbeans, squash, cucumbers, onions, carrots, cabbage, beets, soybeans, alfalfa, bluegrass, green beans, grain sorghum, potatoes, tomatoes, muskmelon, and asparagus. Some injury was noted on alfalfa, cabbage, grain sorghum, green beans and bluegrass. Rates of 6 to 8 lb/A needed for consistent weed control. Ragweed quite resistant.

Methyl dichlorobenzoic acid (HN-1688) (two reports). Provided 90 and 95% preemergence weed control in corn at 2 and 4 lb/A. No injury to crop reported. Three and six lb/A provided 40 and 60% control of Canada thistle.

2,3,3-Trichloroallyl diisopropylthiolcarbamate (CP 23426) (21 reports). The large number of tests on wheat are best summarized by means of a table and a few summary comments.

Application rate lb/A	Control Av. %	Control Range	Wheat injury Av. %	Wheat injury Range	No. tests	No. locations
0.5-0.6	68	25-99	0.6	0-10	42	13
0.75-0.8	70	25-99	0.7	0-5	27	10
1.0-1.1	75	25-98	3.3	0-50	48	17
1.20-1.25	81	35-98	2.9	0-15	33	11
1.5	86	72-100	5.3	0-28	24	7
2.0	91	83-100	21.7	0-100	10	5
3.0	100	-	25.5	5-46	2	1
4.0	100	-	66	32-100	2	2

Multiple incorporations provided better control than single incorporations. Surface applications proved ineffective. Ninety-eight to 99% control of wild oats reported in barley at 1 1/2 lb/A. No crop injury. Ninety-five

to 97% control of wild oats reported in rape at 2 lb/A. No crop injury reported. Domestic oats are only slightly less susceptible to CP 23426 than wild oats.

2-Chloroethyl) trimethylammonium chloride (CCC). Foliage sprays were made on thatcher wheat at two age levels and some multiple treatments. Most marked effects were on plant height, color and maturity. Mean plant heights were reduced up to 17%. Spraying at later growth stage proved superior to early spray. Height reductions of 3 1/2 inches were achieved with 8 lb/A. Shortened plants had marked bluish color and delayed maturity. No consistent yield increases were found.

Triazines.

2-Chloro-4-diethylamine-6-isopropylamino-s-triazine (Ipazine). "Season long" and 100% weed control reported at 2 and 4 lb/A applied as a preemergence spray. Carrots uninjured at 2 lb, potatoes uninjured at 4 lb.

2-Methoxy-4-ethylamino-6-isopropylamino-s-triazine (Ipatone). Eighty-six to 99% weed control reported from preemergence sprays of 2 and 4 lb/A. Soybeans uninjured at 2 lb - slightly injured at 4 lb.

2-Chloro-4-ethylamino-6-diethylamino-s-triazine (Trietazine). Preemergence grass control ranged from 50% to 100%. Good bindweed and lambsquarter control reported, all at 2 lb/A. Potatoes injured at 4 lb/A in one test - uninjured in another. Strawberries uninjured in one report. Postemergence in raspberries unsatisfactory.

2-Methoxy-4-methylamino-6-isopropyl-s-triazine (G 32292). Weed control ranged from 40-70% when used as a preemergence spray at rates of 3/8 lb to 1 1/2 lb/A. Sugar beets were injured slightly at 1 1/2 lb.

2-Chloro-4-ethylamino-6-(3-methoxypropylamino)-s-triazine (G 34696). Weed control reported as "satisfactory" to "all except horse nettle controlled" at preemergence rates of 2 to 4 lb/A. No injury reported for snapbeans and onions. Severe injury reported on soybeans.

2-Chloro-4-isopropylamino-6-methylamino-s-triazine (G 30026). One report showed good weed control as a preemergence spray at 2 lbs per acre. Grain sorghum was uninjured.

2-Allylamino-4-chloro-6-isopropylamino-s-triazine (G 34361). Weed control rated as first out of 27 chemicals as a preemergence spray on potatoes and third out of 27 chemicals for use on peas at rates of 2 lb/A. One report indicated no weed control in wheat at 2 and 4 lb/A.

2-Ethylamino-4-isopropylamino-6-methoxy-s-triazine (Atratone). Eighty-six to 99% weed control reported for preemergence sprays of 2 to 4 lb/A. Soybeans were uninjured.

2-Ethylamino-4-isopropylamino-6-mercapto-s-triazine (Atrametryne). "Satisfactory" to "excellent" to "99" percent weed control reported for preemergence sprays at rates of 2 to 4 lb/A. Injury ratings of none to severe were registered for soybeans. Potatoes, peas, squash and big bluestem were uninjured. Satisfactory weed control was obtained at 1/4 lb in cabbage when used as a postemergence spray.

2,4-bis(isopropylamino)-6-methylmercapto-s-triazine (Prometryne). Preemergence weed control ranged from "unsatisfactory" to "season long" to 99% at rates of 1-4 lb/A. Soybeans, peas, potatoes, squash, cabbage, and carrots appeared uninjured. Wheat was severely injured at 1 lb/A of a postemergence spray. Postemergence sprays proved satisfactory in onions and cabbage at rates from 1/4 to 2 lb/A.

Dioleylamine salt of endothal (TD-66).
Proved unsatisfactory as a preemergence treatment for four vegetable crops at rates up to 10 lb/A. Showed promising selectivity for use in onions and beets as a preemergence spray of 5-10 lb/A.

Di-N,N-dimethyl cocoamine salt of endothal (TD-47).
Not promising as a postemergence spray on beets, cabbage, carrots, onions, and on muck. Provided 100% control of tartary buckwheat at 1 lb per acre in one test.

CP 18-15
Good control of seedling corn spurry at 2 lb/A (postemergence).

Carbo-(2,4-dichlorophenoxyethoxy)ethyl N-phenylcarbamate (BP-3).
Postemergence tests at 1, 2, and 3 lb/A at three growth stages of wild oat gave no measureable control. Wheat was uninjured.

WOODY PLANT CONTROL

Harry M. Elwell

The herbicides 2,4,5-T, silvex, and 2,4-D are quite effective for woody plant control in grasslands, and for pine release in timbered lands. Most effective on a wide range of woody plants is 2,4,5-T. A few woody plants are more readily suppressed by silvex and others are controlled by 2,4-D.

Woody plants generally resistant to these phenoxy herbicides in foliar sprays are elms, maples, hawthorn, ash, buckeye, small-flowered dogwood, mulberry, salt cedar, junipers, fir, and pine. Many of these resistant woody plants may be controlled or killed with 2,4,5-T applied as basal bark or injector treatments.

There is a need for further information on ways of obtaining more consistant effective suppression of woody plants with 2,4,5-T, silvex and 2,4-D. This is especially true when these are applied as foliar sprays. Of major concern is development of greater safety when these herbicides are aerially applied.

Further research is also needed in use of 2,4,5-T as an aerially applied silvicide. Injector applications of 2,4,5-T are a readily accepted and effective method for selective timber stand improvement.

The phenoxy herbicides are also used quite extensively in right-of-ways and industrial sites woody plant control. Basal bark or injector methods of applying the phenoxy herbicides on such sites is considered as readily effective and safe.

The substituted ureas or these combined with trichloroacetate are effective herbicides for woody plant control on right-of-ways and industrial sites. These materials are generally quite effective on most woody plants especially on sandy soil sites. There is still a need for further information in application of these herbicides. Of particular concern is development of ways to control the movement of these chemicals in runoff water, when they are applied in granular or wettable powder forms.

Ammonium sulfamate (AMS) is a very good herbicide for foliar spray applications to control woody plants. This chemical is quite effective on a large number of woody species.

There is still a need for additional new herbicides for control of woody plants. This is especially true for control of resistant species. A new herbicide that produced good control of hawthorn (Crategus crus-galli) was 2-chloro-4-fluorophenoxyacetic acid. In Oklahoma, this herbicide applied at three pounds per hundred gallons of water as wetting spray to hawthorn in full leaf gave excellent control. It was superior in effect to 2,4-D, 2,4,5-T or silvex. There is a need for closer observation of directions for applying all herbicides.

There were only three abstracts received. Root-sprouting was considerably less from willow, western snowberry and wild rose treated with 2,4-D and 2,4-D-2,4,5-T (1:1) in mid-June of 1960 mowed a year later, than from the same species mowed in 1960 and their regrowth treated June of 1961. Diuron at 20 pounds per acre on sandy soil gave satisfactory weed control for five years or more on forest firelanes. Soil injections of Vapam and methyl bromide were equally effective in preventing the spread of oak wilt.

Similarly, soil injections with Vapam (50, 100, 200, or 400 ml of a 1:10 dilution in water per hole, approximately 1½ inch diameter, punched at 1 foot intervals and to depths successively of 1½, 2, 2½, and 3 feet) in heavy soils (Miami silt loam) killed portions of roots and, after 3 years, have prevented further spread of oak wilt in most cases. In contrast to the extensive root kill following high dosages in light sandy soil, much smaller root sections were killed in heavy soils and no foliage injury appeared on any of the nearby trees. Root kill was more uniform at the higher dosages. Similar results followed injections of methyl bromide at 1 lb/5, 10, 15, or 20 linear feet. (Departments of Plant Pathology and Forestry, University of Wisconsin, Madison, Wisconsin.)

Forest fireland weed control with granular Urox and Urab and their effects on adjacent forest trees. Kuntz, J. E. and Dosen, R. C. Weed growth in forest firelanes and access roads on Plainfield sand in central Wisconsin constitutes a serious fire hazard and greatly reduces their effectiveness as firebreaks. Annual weed control by mechanical means has critical limitations including high costs, vigorous plant regrowth, and possible soil erosion. Sought are herbicides which, as a single application, would eliminate all or nearly all weeds and grass for several seasons. Of many different herbicides, tested alone and in combinations since 1948, diuron at 20 lb/A proved most effective, giving satisfactory weed control for 5 or more years (NCWCC, 1960). In June, 1959, granular Urox (3-(p-chlorophenyl)-1, 1-dimethylurea trichloroacetate) at 11, 22, 33, 44, 66, and 88 lb/A, was broadcast uniformly to established weeds in replicated 1/100A firelane plots, bordered by pine plantations or natural oak-pine stands. First-season weed control was excellent at 66 and 88 lb/A, but decreased progressively at the lower rates. Slight foliage injury also developed on northern pin oaks (Quercus ellipsoidalis Hill), 4-8 inches dbh, growing within 20 feet of the treated areas. During the second season, rates of 22, 33, 44, 66, and 88 gave excellent weed control (nearly complete kill), but caused increasingly severe injury and mortality to jack pine (Pinus banksiana Lamb.), 3 to 6 inches dbh, growing within 15 feet of the treated area. Bordering northern pin oaks

showed increasing foliage injury at 44 lb/A and above, but bur oaks (Q. macrocarpa Michx.) tolerated even the higher rates. During the third season, sparse regrowth of sedge and grass occurred even at the higher rates. Urab (3-phenyl-1,1-dimethylurea trichloroacetate), similarly tested, gave better weed control the first season, but permitted considerable regrowth the second year. Both oaks and pine were severely injured at the higher rates. (Department of Plant Pathology and Forestry, University of Wisconsin, Madison, Wisconsin, and Nekoosa Edwards Paper Company, Port Edwards, Wisconsin.)

AQUATIC WEED CONTROL

Mark G. Wiltse

Increased research in the field of aquatic weed control is noted in this area. Polyethylene enclosures were successful in containing the chemical for plot application so that evaluations were more meaningful. Several new chemicals were evaluated for the control of algae, floating, submerged rooted and emergent rooted aquatic weeds.

Algae.
Copper sulphate at 1 ppmw continued to give satisfactory control. Diquat at 5 ppmw satisfactorily controlled Spirogyra, Hydrodictyon, Oscillatoria, Anabaena, Cladophora and Chara spp. while the following chemicals failed to control them; copper methanearsonate and silver methanearsonate at 5 ppmw, 2-amino, 3-chloro, 4-napthaquinone at 0.1 ppmw, dichlone at 0.15 ppmw, and lithium salt of 2.4D at 4 ppmw. Disodium salt of endothal did not control algae in most tests. Coco amine salt of endothal was reported to be more effective on algae than the disodium salt of endothal.

Floating aquatics.
Duckweed (Wolffia, Spirodela, Lemna spp.) were controlled with 2-amino-3-chloro-4-napthoquinone at 10 lb/A. Unsatisfactory control was obtained with copper methanearsonate and silver methanearsonate at 5 ppmw; tris(1-dodecyl-3-methyl-2-phenylbenzimidazolium) ferricyanide at 25 ppmw, diquat at 4 lb/A, dichlone at 10 lb/A, lithium salt of 2,4-D at 7 ppmw, disodium salt of endothal at 5 gpa, dalapon at 20 lb/A, diesel oil, and kerosene.

Submerged rooted aquatics.
Pondweeds (Potamogeton spp.), water milfoil (Myriophyllum spp.) and coontail (Ceratophyllum spp.) were controlled with the following materials; silvex 2 ppmw, potassium salt of silvex 2 to 3 ppmw, disodium salt of endothal 1 to 5 ppmw, diquat at 1 to 5 ppmw, 2,4-D at 3 ppmw. Atrametryne (2-ethylamino-4-isopropylamino-6-methylmercapto-s-triazine) at 4 to 5 ppmw gave control but caused irritation and killed some small fish. Disodium salt of endothal was effective on most pondweeds at 1 ppmw but concentrations of 3 to 5 ppmw were required to control water milfoil and coontail and 5 ppmw did not control Cabomba caroliniana. Endothal is safe on fish at these rates. Diquat controlled several pondweeds at 1 to 2 ppmw but concentrations of 3 to 4 ppmw were required to control Elodea canandensis and Ranunculus spp. Diquat failed to control Najas flexilis and N. gracillima at 4 ppmw.

The propylene glycol butyl ether ester of silvex and the potassium salt of silvex were similar in performance on aquatic weeds but the potassium salt formulation has a very low order of toxicity to fish. Silvex has failed to control some species of pondweed at 2 ppmw but controlled coontail, water milfoil, Cabomba caroliniana, Elodea canadensis, and Ranunculus spp. at this rate.

Both granular and liquid formulations of these herbicides were effective for the control of submerged rooted aquatic weeds.

Emergent rooted aquatics.

Cattails (Typha latifolia and T. angustifolia) were controlled with wetting sprays of dalapon at 15 to 25 lb, amitrole at 12.5 lb and mixed butyl and isopropyl esters of 2,4-D at 10 lb aehg. Additional detergent added to the spray solution improved control.

Amitrole T at 2 lb aihg did not give complete control of cattails, however, it did control reed canarygrass as did dalapon at 20 lb aihg of water.

Scirpus acutus, S. latifolia, and Diantha americana were controlled with 2,4-D and silvex applied as a granular at 20 lb/A and as a wetting spray at 10 lb aehg.

Sagitaria latifolia was controlled by wetting sprays of diquat at 10 lb aehg, disodium endothal at 25 ppmw and silvex at 6 lb aehg.

Water lillies were controlled with silvex, potassium salt of silvex and 2,4-D.

Some investigations were undertaken to determine the indirect effect of the use of aquatic herbicides on the bottom dwelling fish food organisms. There was no direct obvious effect on bottom fauna from disodium salt of endothal, coco amine salt of endothal, simazine, atrazine, monuron, polychlorobenzoic acid and silvex. Some reduction in bottom fauna was noted with sodium arsenite, copper sulfate, neburon, 2,4-D, and copper EDTA.

MECHANICAL CONSIDERATIONS

W. G. Lovely

Mechanical considerations in a comprehensive program of weed control include the proper use of seed cleaning, tillage, chemical application and harvesting equipment. No one machine or operation in the above group will give satisfactory weed control when used exclusively without regard for the others. Prior to the discovery of 2,4-D and other herbicides the major emphasis was on mechanical or cultural methods of weed control. As new herbicides were discovered, the emphasis shifted to herbicides and equipment to apply them. For the past several years weed researchers have been taking a new look at the old mechanical and cultural practices along with equipment and techniques for applying granules. New and better herbicides and equipment for applying them will be developed along with new and improved equipment for mechanically controlling weeds.

The major interest in the next few years will be on the development of weed control systems (combinations of seedbed preparation, herbicide applications, and cultivations) that will give the most effective and economical control of weeds. The use of granular formulations will continue to expand and equipment will be improved for more accurate metering and distribution.

Tillage equipment. Some recent research indicates that it may be possible to reduce the number of seedbed preparation operations by using late fall or early spring applications of herbicides to control weed growth prior to planting. Likewise summer fallowing with herbicides has shown promise. The "reduced tillage" or "minimum tillage" concept has become popular in the past 2 or 3 years, and effective herbicides play a vital role in the success of these tillage practices.

Excessive tillage is costly and frequently causes yield reductions. However, weeds must be controlled either chemically or mechanically to obtain maximum yields. To completely eliminate mechanical tillage herbicides must give effective weed control under all soil and climatic conditions, and it must be proven that manipulating the soil with tillage tools aids crop production only by controlling weeds.

In view of these developments, changes in tillage tools and practices can be expected in the near future. It is highly improbable that chemicals will completely eliminate mechanical tillage under all conditions, but changes in the kinds of tools and the number of operations can be expected. Timely use and proper adjustment of tillage tools will continue to be of utmost importance.

Herbicide application equipment. Construction materials for spray tanks are changing. Plexi-glass tanks, plastic linings for tanks, and glass-lined tanks are examples of some of the materials now being used. The "oil barrel" spray tank is rapidly disappearing, and tanks made of aluminum or stainless steel are becoming common. Corrosion has become less of a problem. However, some of the spray materials cause deterioration of plastics and others will cause damage to other materials being used for tank construction. Operators should check with the chemical suppliers to make sure that the herbicides they are using will not cause damage to the spray tanks.

Spray nozzles are also changing. Materials such as aluminum and various types of plastics are now being used in the construction of nozzle bodies and even nozzle tips. The wear characteristics of some of these new nozzles have not been adequately determined, and frequent calibration is necessary.

Granular application equipment. Most herbicides are now being offered in a granular formulation. The development of equipment for applying granules has been extremely rapid. In 1959 and 1960 the available equipment was doing only a fair job of metering and spreading granules. The results obtained in 1961 indicate substantial improvements, particularly with the planter attachments. It is as essential to calibrate granular applicators as it is to calibrate sprayers. Granules must be metered accurately and spread uniformly for maximum control. Most of the granular applicators require a constant field speed and every effort should be made to keep the speed as uniform as possible.

Some breakdown of granules occurs with all application equipment. For the most part, this is not serious; however, excessive amounts of fines may result in uneven distribution and erratic control.

In selecting a granular applicator the accuracy of metering, the uniformity of distribution, and the amount of granular breakdown should be carefully considered. Other features to consider are:

1. Hoppers: Filling of hoppers should coincide with filling of seed or fertilizer hoppers. They should be easily accessible for loading, adjusting, and cleaning. Covers should be watertight and large enough to make cleaning and filling an easy operation.

2. Mountings: Application equipment should be mounted so that granules will flow freely from the metering device to the spreading device. Loops or bends in the delivery tubes will cause uneven distribution. Driving mechanisms (chains, sprockets, etc.) must be mounted so that they will stay in adjustment and not become clogged with trash. The equipment should be solidly mounted so that vibrations set up by rough field travel will not shake hoppers or driving mechanisms loose.

AUTHOR INDEX

WEEDS, CROPS, AND GENERAL INDEX

HERBICIDE LIST AND INDEX

The nomenclature of this list is based so far as possible on the Report of the Terminology Committee of the Weed Society of America (Weeds 8:487-521). Herbicides are indexed under the common name given in that list if there is one; otherwise under the chemical name; trademarks and code numbers are given for identification.

At a meeting of the Executive Committee of the Weed Society of America in St. Louis, December 10, 1961, a number of additional common names and abbreviations were recommended by the Terminology Committee and approved by the Executive Committee. Some of these dedicate trademarks as common names; some are new abbreviations by the Terminology Committee. The text of these reports was already run by that date, but this index includes the new terms and changes, each indicated by a preceding asterisk.

The "Summary of New Research Findings" has not been indexed for herbicides.

Names which begin with numerals are indexed as if spelled out; proper capitalization is indicated.

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